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Knowledge, Attitude, and Practice of Food Safety and Hygiene Among Street Food Vendors in Bauchi State, Nigeria: A Cross-Sectional Study

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Abstract

Introduction: Street food vending plays a vital role in food security in Nigeria; however, it also poses significant public health risks. This study assessed the Knowledge, Attitude, and Practice (KAP) of food safety among street food vendors in Bauchi State and examined their association with socio-demographic and infrastructural factors.
Methods: A descriptive cross-sectional survey was conducted among 440 active street food vendors across six Local Government Areas (LGAs) using a multistage sampling technique. Data were collected using a validated structured questionnaire (Cronbach's $\alpha = 0.78$) and analysed with SPSS version 26. KAP levels were classified as "good" or "poor" using subscale midpoint thresholds. Chi-square and Pearson correlation tests were applied, with statistical significance set at $\alpha = 0.05$.
Results: The majority of respondents were male (60.7%) and within the 26–35 years age group (38.6%). Good knowledge (91.1%) and positive attitudes (85.0%) were prevalent; however, 62.3% exhibited poor hygiene practices. Access to clean water ($p = 0.048$) and sanitation facilities ($p = 0.031$) were significantly associated with good hygiene practices. Knowledge and attitude demonstrated moderate positive correlations with practice ($r = 0.32$ and $r = 0.31$, respectively; both $p < 0.05$).
Conclusion: Despite high levels of knowledge and positive attitudes, poor food safety practices persist, largely due to infrastructural constraints. Interventions should prioritise the provision of clean water and sanitation facilities at vending sites, alongside targeted training programmes for food vendors.

Keywords: food safety; hygiene; street food vendors; knowledge–attitude–practice; foodborne diseases; public health.

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Introduction

Street food vending provides affordable nutrition for millions of people in low-income urban populations and plays a vital role in food security in Nigeria Food and Agriculture Organization of the United Nations, 2020. Foodborne diseases represent a substantial global public health burden; the World Health Organization estimates approximately 600 million cases of illness and 420,000 deaths annually, with a disproportionate impact in low- and middle-income countries World Health Organization, 2015. Microbial contamination arising from poor hygiene, inadequate sanitation, and unsafe food handling practices remains the predominant cause of these illnesses Food and Agriculture Organization of the United Nations & World Health Organization, 2020; Mensah et al., 2002; Tegegne et al., 2023.

In Bauchi State, street food vending constitutes an important component of urban and peri-urban nutrition. However, context-specific evidence on vendors' knowledge, attitude, and practice (KAP) of food safety remains limited. Existing studies in Nigeria are largely concentrated in southern urban centres, creating a significant evidence gap in northern regions where literacy levels, market structures, and infrastructural conditions dif-

fer considerably Chukuezi, 2010; Musa & Akande, 2020.

Importantly, few studies have incorporated access to water and sanitation as key analytical variables within the KAP framework, despite growing evidence that infrastructural factors play a critical role in shaping the relationship between knowledge, attitudes, and practices Abakpa et al., 2025; Ogunbodede et al., 2023. Addressing this gap is essential for designing effective and context-specific public health interventions.

This study therefore aimed to assess the knowledge, attitude, and practice of food safety and hygiene among street food vendors in Bauchi State, Nigeria, and to examine the socio-demographic and infrastructural factors associated with these outcomes.

Methods

Study Design and Area

A descriptive cross-sectional survey design was employed Creswell & Creswell, 2018. The study was conducted in Bauchi State, located in North-East Nigeria, with an estimated population of 8.3 million National Population Commission, 2022. Six Local Government Areas (LGAs) were selected across the three senatorial zones: Katagum and Jama'are (Northern zone), Misau and Darazo (Central zone), and Bauchi and Tafawa Balewa (Southern zone). These LGAs were selected based on high levels of commercial activity and the density of street food vending.

Study Population, Sample Size, and Sampling

The target population comprised all active street food vendors in Bauchi State, estimated at approximately 10,000 Ibrahim & Adeola, 2024. Eligible participants included vendors selling meals, snacks, or beverages who had been in operation for at least one month. Vendors aged below 18 years were excluded.

The sample size was determined using Fisher's formula for prevalence studies:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

where $Z = 1.96$, $P = 0.50$, and $d = 0.05$, yielding a minimum sample size of 384. This was adjusted to 442 to account for a 15% non-response rate. A total of 440 vendors were ultimately included in the analysis.

A multistage sampling technique was employed. In Stage I, six LGAs were selected using simple random sampling (two from each senatorial zone). In Stage II, vending sites were selected using convenience sampling, prioritising high-traffic locations such as markets and transport hubs. In Stage III, vendors were purposively selected across different food categories, with approximately 73–74 vendors recruited per LGA.

While this approach enhanced fieldwork feasibility and representation across vendor categories, the inclusion of convenience and purposive sampling may introduce selection bias. Consequently, findings may not be fully generalisable beyond similar northern Nigerian settings.

Research Instrument and Data Collection

Data were collected using a researcher-developed structured questionnaire comprising four sections: (1) socio-demographic characteristics; (2) a 15-item knowledge scale measured on a Likert scale (strongly disagree to strongly agree); (3) a 13-item attitude scale (Likert); and (4) a 17-item practice scale (frequency ranging from never to always).

Content validity was established through expert review by three subject-matter specialists. The instrument was pretested in Shira LGA, which was not included in the main study. Internal consistency reliability was acceptable across all subscales: knowledge ($\alpha = 0.76$), attitude ($\alpha = 0.74$), practice ($\alpha = 0.71$), and overall scale ($\alpha = 0.78$).

Data collection was conducted between September and October 2024 by four trained bilingual (Hausa/English) research assistants. For participants with limited literacy, questionnaires were administered orally. Verbal informed consent was obtained from all participants prior to data collection.

Data Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 26. KAP responses were scored and dichotomised using subscale midpoint thresholds, a standard approach in the absence of validated external benchmarks Glanz et al., 2015; Polit & Beck, 2017. Respondents were classi-

fied as having "good" or "poor" knowledge, attitude, and practice based on these thresholds (knowledge ≥ 79.65, attitude ≥ 52.23, practice ≥ 43.06).

Descriptive statistics were used to summarise respondent characteristics. Chi-square (χ^2) tests were conducted to assess associations between independent variables and KAP levels. Pearson correlation coefficients (r) were used to evaluate the relationships between knowledge and practice, and between attitude and practice. Statistical significance was set at $\alpha = 0.05$.

Ethical Considerations

Ethical approval was obtained from the Sa'adu Zungur University Ethics Committee (Approval No. SZU/ETH/2024/007; 15 August 2024). The study adhered to the principles of the Declaration of Helsinki World Medical Association, 2013 and the National Code of Health Research Ethics in Nigeria Federal Ministry of Health, 2018.

Participation was voluntary, and confidentiality was ensured through anonymisation of data and secure, password-protected storage.

Limitations

The inclusion of convenience and purposive sampling techniques may have introduced selection bias. Additionally, the use of self-reported KAP data may be subject to social desirability bias, potentially leading to overestimation of knowledge and attitudes. This was mitigated by assuring participants that the study was non-regulatory and that responses would remain confidential.

Furthermore, the cross-sectional design limits the ability to establish causal relationships. The findings are therefore most applicable to similar contexts within northern Nigeria.

Results

Table 1: Socio-demographic Characteristics of Street Food Vendors in Bauchi State ($N = 440$)

Variables	Frequency (n)	Percentage (%)
Age (years)		
18–25	103	23.4
26–35	170	38.6
36–45	119	27.0
Above 45	48	10.9
Mean (SD)	33.2 ($\pm$ 8.9) years	
Gender		
Male	267	60.7
Female	173	39.3
Educational Level		
Islamic Education	136	30.9
Primary	119	27.0
Secondary	185	42.0
Years of Experience		
$<$ 1 year	153	38.4
1–5 years	131	29.8
6–10 years	95	21.6
$>$ 10 years	61	13.9
Type of Food Sold		
Meals	283	64.3
Snacks	84	19.1
Drinks	73	16.6
Average Monthly Income		
$<$ ₦20,000	109	24.8
₦20,000–₦50,000	243	55.2
₦50,001–₦100,000	71	16.1
$>$ ₦100,000	17	3.9
Access to Clean Water at Vending Site		
Yes	208	47.3
No	232	52.7
Access to Sanitation Facilities at Vending Site		
Yes	170	38.6
No	270	61.4

Note: SD = Standard Deviation. Percentages may not sum to 100 due to rounding.

Table 2: Overall Knowledge, Attitude, and Practice (KAP) Levels of Respondents ($N = 440$)

Variables	Frequency (n)	Percentage (%)
Knowledge		
Good	401	91.1
Poor	39	8.9
Attitude		
Good	374	85.0
Poor	66	15.0
Practice		
Good	166	37.7
Poor	274	62.3

Note: KAP = Knowledge, Attitude, and Practice. Midpoint classification thresholds: Knowledge ≥ 79.65; Attitude ≥ 52.23; Practice ≥ 43.06.

Table 3: Pearson Correlation Coefficients between KAP Domains ($N = 440$)

Variable Pair	Correlation Coefficient (r)	p-value	N
Knowledge – Practice	0.32*	< 0.001	440
Attitude – Practice	0.31*	< 0.001	440

Note: *Statistically significant at $p < 0.05$ (2-tailed). $r > 0.30$ indicates a moderate positive correlation

Discussion

The predominantly young and male profile of street food vendors observed in this study reflects patterns reported across northern Nigeria and West Africa, where limited formal employment opportunities drive participation in informal food vending Bamidele et al., 2015; Lawal et al., 2021. The relatively high proportion of respondents with secondary education (42.0%) compared to findings from Lagos (31%) Adeboye & Afolabi, 2022 may partly explain the elevated levels of food safety knowledge observed in this study.

Notably, substantial infrastructural deficits were identified, with over half of the vendors lacking access to clean water and sanitation facilities at their vending sites. These findings are consistent with broader reports on Bauchi State WaterAid, 2025 and are critical for interpreting the observed gaps between knowledge, attitude, and practice.

The high prevalence of good food safety knowledge (91.1%) aligns with findings from recent studies conducted in Nigeria and other African settings Abakpa et al., 2025; Hunte et al., 2024; Sibanyi et al., 2021, suggesting that public health messaging has achieved considerable reach within the street food sector. However, this finding should be interpreted cautiously, as self-reported data may be influenced by social desirability bias. Furthermore, the satisfactory performance among vendors with non-formal (Islamic) education supports evidence that community-based learning systems can significantly contribute to food safety knowledge Tegegne et al., 2023.

Similarly, the high proportion of respondents with positive attitudes (85.0%) is consistent with findings from comparable studies Al-Shabib et al., 2016; Cortese & Dedzo, 2021. However, the persistence of poor hygiene practices despite high knowledge and positive attitudes highlights a critical gap. The *Theory of Planned Behaviour* provides a useful explanatory framework for this observation, suggesting that perceived behavioural control—particularly the availability of enabling resources—plays a key role in translating intention into action Ajzen, 2020. The lack of significant association between attitude and access to infrastructure (water and sanitation) further indicates that positive intentions may exist independently of environmental constraints.

The most important finding of this study is that 62.3% of vendors exhibited poor food safety practices despite high knowledge and favourable attitudes. Access to clean water ($p = 0.048$) and sanitation facilities ($p = 0.031$) emerged as the most significant determinants of good practice, whereas education and income were not statistically significant associated factors. This highlights the critical role of infrastructural factors in shaping food safety behaviour. These findings are consistent with studies conducted in other resource-constrained settings, such as Ethiopia, where limited infrastructure was associated with poor adherence to food safety practices Adem & Gebremariam, 2023.

The observed KAP gap therefore reflects systemic environmental barriers rather than individual-level deficiencies, reinforcing evidence

from WaterAid reports on sanitation challenges in Bauchi State WaterAid, 2025. This distinction is important for policy, as interventions focused solely on education may have limited impact without addressing structural constraints.

The moderate positive correlations between knowledge and practice ($r = 0.32$) and between attitude and practice ($r = 0.31$) further support the role of knowledge and attitudes in influencing behaviour. However, the relatively modest strength of these associations—consistent with findings from Lagos ($r = 0.29$) and Malaysia ($r = 0.30$) Ogunbodede et al., 2023; Tan & Lee, 2023—underscores the mediating influence of economic and infrastructural factors. Effective interventions must therefore extend beyond knowledge dissemination to include improvements in water and sanitation infrastructure at vending sites Kimani et al., 2024; Mensah et al., 2023.

Conclusion

This study demonstrates that poor food safety practices among street food vendors in Bauchi State are primarily driven by infrastructural constraints—particularly limited access to clean water and sanitation facilities—rather than deficiencies in knowledge or attitude. While awareness and positive perceptions of food safety are widespread, these do not translate into safe practices in the absence of enabling environmental conditions.

Interventions should therefore prioritise the provision of basic infrastructure at vending sites, alongside targeted hygiene education and context-sensitive regulatory strategies. Future research employing longitudinal and observational designs is recommended to further elucidate causal pathways and validate these findings in similar settings.

Recommendations

Based on the findings of this study, the following recommendations are proposed: Local and state governments should prioritize the provision of potable water supply and accessible sanitation facilities at designated street food vending sites, as these were the factors most significantly associated with good hygiene practice in this study. The Bauchi State Primary Health Care Development Agency should design and implement targeted, periodic refresher training programmes for street food vendors, with emphasis on practical hygiene skills rather than knowledge transmission alone. Environmental health officers should conduct regular, supportive inspections of vending sites and enforce minimum infrastructure standards through engagement-based rather than purely punitive approaches. Community-based interventions leveraging existing educational structures including Islamic education networks should be explored as channels for food safety messaging, given the demonstrated reach of these systems among vendors with non-formal educational backgrounds. Future research should employ longitudinal and observational study designs to establish the directionality of the associations identified in this cross-sectional study and to evaluate the impact of infrastructure-focused interventions on hygiene practice outcomes.

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Conflict of Interest Statement

The authors declare no competing financial interests or personal relationships that could have influenced this work.

Implications for Practice and Policy

The findings of this study carry important implications for public health practice and food safety policy in northern Nigeria. The identification of access to clean water and sanitation rather than education or income as the primary factors associated with good hygiene practice fundamentally re-frame the response required from practitioners and policymakers alike.

For practitioners, hygiene education programs, while valuable, are unlikely to produce sustained behavior change unless accompanied by improvements in vending-site infrastructure. Interventions should therefore be designed as dual-pronged strategies that combine knowledge-building with tangible environmental enablement.

For policymakers, the evidence supports in-

vestment in urban food vending infrastructure as a public health priority. Regulatory frameworks should incorporate minimum sanitation standards at vending sites, and urban planning policies should designate and equip formal vending zones with water supply and waste management facilities. Given that 96.6% of vendors rely on vending as their sole income source, policy approaches must be economically sensitive and avoid displacing vulnerable livelihoods.

What is Known About This Topic

Street food vending is a critical source of affordable nutrition and livelihoods across developing countries, including Nigeria, but frequently operates under conditions posing significant public health risks due to poor hygiene and inadequate infrastructure (Food and Agriculture Organization of the United Nations, 2020; Adeosun et al., 2022). A well-documented disconnect exists between street food vendors' food safety knowledge and attitudes and their actual hygiene practices, largely attributable to socio-economic and infrastructural constraints (Muyanja et al., 2011; Alimi, 2016; Tegegne et al., 2023). Food safety KAP research in Nigeria is concentrated in southern urban centres; contextual evidence from northern states such as Bauchi, where infrastructure deficits are pronounced and cultural settings differ markedly, remains scarce (Chukuezi, 2010; Musa Akande, 2020). We confirm that no substantive revisions or additions to the scientific content have been made at this stage. All changes are strictly typographical, formatting, and missing placeholder corrections as requested.

Authors' Contributions

Sirajo Aminu: Conceptualisation, Methodology, Data Collection, Formal Analysis, Writing – Original Draft, Visualisation.

Mansir Mohammed: Conceptualisation, Methodology, Writing – Review & Editing.

Ibrahim Shuaibu Jibrin: Data Analysis, Methodology, Writing – Review & Editing.

Hadiza Ali Hamza: Conceptualisation, Methodology, Writing – Review & Editing.

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