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# Food Hygiene Practice Among Food Vendors in Osun State

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***Abstract***

*Foodborne diseases present a significant public health threat worldwide, especially in low- and middle-income countries where inadequate food safety measures lead to high morbidity and mortality rates. In Nigeria, improper food handling and poor hygiene practices among street vendors contribute to the spread of foodborne illnesses such as diarrhea and cholera. This study aims to assess the food hygiene practices among food vendors in Osun State, Nigeria, and identify sociodemographic factors influencing these practices. A cross-sectional descriptive study was conducted among 300 food vendors in Osun State, selected through a multistage sampling technique. Data were collected using a pre-tested self-administered questionnaire designed based on objectives and analysed using an IBM SPSS version 25.0. The majority of vendors (88.7%) were female, and 67.0% had received prior food safety training. The findings revealed that 68.0% of vendors had access to adequate handwashing facilities, and 90.0% operated weather-protected stalls. Younger vendors (aged 16–24 years) showed significantly better hygiene practices compared to older age groups. Vendors with food safety training were over twice as likely to exhibit good hygiene practices compared to untrained vendor. Education level was significantly associated with food safety practices. Pest presence (61.7%) and handling money while serving food (64.0%) were identified as key risks in food preparation areas. Age, education, and food safety training were found to be significant predictors of hygiene compliance. Targeted interventions focusing on education, infrastructure, and behavioral change are recommended to improve food safety, especially for younger and less experienced food vendors.*

***Keywords:*** *Food Hygiene, Foodborne Diseases, Food Safety, Food Vendors, Public Health.*

## Introduction

Food functions as a central means to satiate hunger and meet biological requirements. It plays a crucial role in sustaining our existence, enabling us to engage in activities such as household tasks, academic pursuits, employment, and physical exercise [1, 2]. Presently, individuals have the option to relish food either within the confines of their homes or in external environments. Due to the proliferation of street vendors, restaurants, and various food establishments, people are more likely to seek out places to alleviate hunger when they are fatigued from work and lack the time to prepare meals at home [3].

Foodborne diseases contribute significantly to morbidity trends globally, affecting millions of individuals annually. In the United States alone, an estimated 9.4 million illnesses, 56,000 hospitalizations, and 1,350 deaths are attributed to major foodborne pathogens each year [4]. Vulnerable populations such as the elderly,

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pregnant women, immunocompromised individuals, and children are at higher risk of severe outcomes from foodborne illnesses [5].

Diarrheal illnesses stand out as the most prevalent singular consequence amidst the 31 food-related dangers cataloged by the Foodborne Epidemiology Reference Group (FERG), causing 550 million instances and 230,000 fatalities, while encompassing over half of the global foodborne disability adjusted life years (DALYs) [6]. Nearly one in every ten individuals worldwide falls ill post consumption of contaminated food, with 420,000 individuals succumbing annually, leading to a loss of 33 million years of healthy life. Children under 5 years old, with 125,000 fatalities per year, represent 40% of the total burden of deaths due to foodborne diseases [7].

Enhancing food safety in low- and middle-income nations (LMICs) emerges as a pressing matter. It is estimated that foodborne diseases result in 600 million illnesses and 420,000 premature fatalities each year [8]. The brunt of this impact is borne by individuals residing in LMICs [9], accounting for approximately 75% of deaths due to foodborne ailments (in contrast to 41% of the global populace). This holds especially true for Africa, where the per-person toll of foodborne diseases exceeds that of Europe or North America by 27 times and the healthcare infrastructure grapples with limited capabilities for diagnosis and treatment [8, 10].

Food poisoning causes over 200,000 deaths in Nigeria each year and various measures have been taken to address the problem and improve sanitation. However, good hygiene, adherence to food safety rules and monitoring food quality can reduce the incidence of foodborne illnesses [5]. According to Barnabas [6], the World Health Organization (WHO) has adopted five important principles to improve food safety: ensuring all products are clean, separating raw from cooked foods, clean, cooked foods, keeping foods at low temperatures, and clean food. Failure to comply with various food safety measures leads to foodborne illnesses [7]. Barnabas et al. [6] identifies the causes as inadequate food production, lack of hygiene education, unhealthy water, lack of sanitation or poor food production, pesticides and poor personal hygiene. Food poisoning occurs in Northern Nigeria, but there is limited information on the effects of food. The poisoned situation of food vendors in Southern Nigeria. Also, university students are one of the most vulnerable groups due to their dangerous eating habits [8, 9].

In Nigeria, despite the prevalence of unreported foodborne illness (UFID) cases, few cases have been officially recorded. Take the tragic incident in Ibadan, Oyo State, where 20 people died after eating improperly preserved sandwiches contaminated with Salmonella [11]. Reports have also identified cases of foodborne illness due to Staphylococcus aureus contamination at Ambrose Ali University and nearby areas. In addition, three deaths and 60 illnesses were reported due to the consumption of food at a funeral, resulting in gastrointestinal infections. Furthermore, a settlement predominantly inhabited by Fulani herders recorded 62 deaths in 2017 due to zoonotic bacterial infections causing gastroenteritis and diarrhea [12].

The hygienic standards of restaurants and food stalls in Nigeria significantly impact the quality of food they serve, as evidenced by studies on foodborne diseases and microbial contamination [13]. Poor hygiene practices among food handlers and vendors have been linked to the prevalence of foodborne illnesses, highlighting the importance of maintaining proper personal hygiene, environmental sanitation, and food preparation techniques to prevent disease outbreaks [14]. Hence this study aims to explore the food hygiene practices among food vendors in Osun State.

## Materials and Methods

This study was conducted as a descriptive cross-sectional study targeting 300 food vendors in different local government areas of

Osun State, Nigeria. The state is divided into three senatorial districts, Osun Central, Osun East and Osun West, and contains 30 local government areas. The sample size was determined using the Leslie Fisher formula, which gave a coverage of 75.5%. This is the proportion of food vendors with poor hygiene practices in previous studies conducted in Nigeria [15]. The minimum sample size was 284, which was adjusted to 300 after adjusting for a non-response rate of 5%. The study's objective was to assess food vendors' practices on food hygiene in Osun State.

Participants were selected using a multi-stage sampling technique. Stage 1: Randomly select two local governments from each senatorial district. Stage 2: Randomly select five wards from each selected local government area. Stage 3: Systematic sampling of food vendors in the selected areas. Data collection was conducted using a structured questionnaire and an observation checklist. The questionnaire covered demographic information, food hygiene practices, and self-reported practices. An observation checklist was used to assess actual hygiene practices during food preparation and handling. Study sites included large markets, bus stops, and popular street food outlets in urban and rural areas. This approach ensured a diverse representation of food vendors across Osun State, reflecting differences in practices that may exist due to different contexts and customer bases. A purposely designed self-administered questionnaire was used to obtain data from study participants after a pre-test done outside of the study area.

The Ministry of Health Osun State, Nigeria, and the Ethics and Research Committee (OSHREC/PRS/569T/458) approved the study's conduct. Consent was obtained from each participant, who was assured of confidentiality.

Data collected were analyzed using IBM SPSS Statistics version 25.0 software. Results were presented using tables and charts, and chi-square and logistic regression analyses were generated, with confidence levels set at 95% and a P-value <0.05 considered significant. There were total of 16 questions for practices-related statements, where correct responses were scored as one and incorrect responses were scored as zero. The scores were summed up to obtain an overall score for each respondent, with a range of 0 to 16. Correct responses were assigned one point and wrong responses zero. The total summed-up scores ranged from 0-16. Practice related questions were further categorized using the median or 50% percentile score as the cut-off point (Good practices (≥50% score) or poor practices (<50% score)). Additionally, an Observational Checklist with 11 items was used to assess actual hygiene practices.

## Results

**Table 1.** Sociodemographic Characteristics of the Respondents (n=300)

| Variables | Frequency (n = 300) | Percentage (%) |
|---|---|---|
| **Age** | | |
| **Mean± SD** | | |
| 16-24 years | 40 | 13.3 |
| 25 – 39 years | 143 | 47.7 |
| 40-59 years | 117 | 39.0 |
| **Sex** | | |
| Female | 266 | 88.7 |
| Male | 34 | 11.3 |
| **Marital Status** | | |
| Single | 64 | 21.3 |

| | | |
|---|---|---|
| Married | 208 | 69.3 |
| Divorced | 14 | 4.7 |
| Separated | 14 | 4.7 |
| **Educational Level** | | |
| No formal Education | 19 | 6.3 |
| Primary | 42 | 14.0 |
| Secondary | 110 | 36.7 |
| Tertiary | 129 | 43.0 |
| **How long have you been vending food?** | | |
| Less than 12 months | 11 | 3.7 |
| 1 -3 years | 97 | 32.3 |
| 4-5 years | 72 | 24.0 |
| Over 5 years | 120 | 40.0 |
| **Have you undergone any training on food safety and hygiene** | | |
| Yes | 201 | 67.0 |
| No | 99 | 33.0 |

The sociodemographic profile of the food vendors showed that the majority (47.7%) were aged between 25 and 39 years, while 39.0% were aged between 40 and 59 years. A smaller group of 13.3% were aged between 16 and 24 years. The gender distribution was markedly skewed, with females making up the majority (88.7%) of the food vendors, while males comprised only 11.3% of the sample. In terms of marital status, more than two-thirds (69.3%) of the food vendors were married, 21.3% were single, and an equal proportion (4.7% each) were divorced or separated. The education level of the food vendors varied, with the largest group (43.0%) having a college degree, followed by 36.7% with high school education, 14.0% with elementary education, and 6.3% with no formal education. Trade experience was significant at 40.0% with more than 5 years of experience in the food trade. 32.3% had 1 to 3 years of experience, and 24.0% had 4 to 5 years of experience. Only a small percentage (3.7%) had less than 12 months of experience in the food retail industry. In particular, two-thirds (67.0%) of the respondents reported having received food safety and hygiene training, while one-third (33.0%) did not. This distribution provides insight into the level of formal food safety training of suppliers in the study area (Table 1).

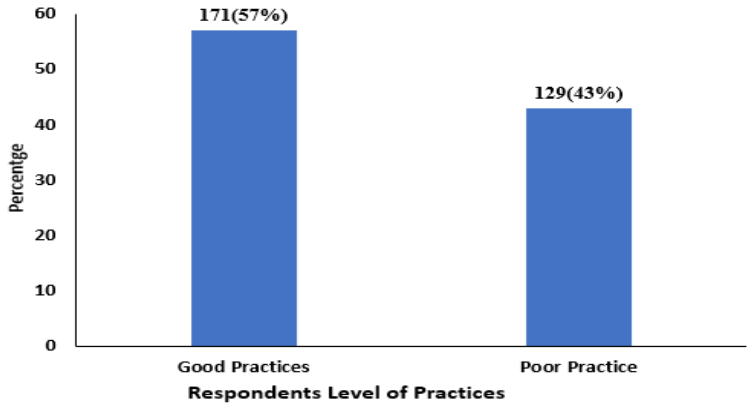


Figure 1: Level of food hygiene practices among food vendors in Osun State.

**Figure 1.** Level of Food Hygiene Practices Among Food Vendors in Osun State

**Table 2.** Association between Practices of Food Hygiene, and Sociodemographic Characteristics of Food Vendors

| Variables/Sub-variables | Level of Practices | | Statistics $\chi^2$, p |
|---|---|---|---|
| | **Poor n=129 (%)** | **Good n=171 (%)** | |
| **Age** | | | |
| 16-24 years | 25(62.5) | 15(37.5) | $\chi^2$= 7.191# |
| 25 – 39 years | 56(39.2) | 87(60.8) | p = **0.027** |
| 40-59 years | 48(41.0) | 69(59.0) | |
| **Sex** | | | |
| Female | 119(44.7) | 147(55.3) | $\chi^2$= 2.297* |
| Male | 10(29.4) | 24(70.6) | p = 0.130 |
| **Marital Status** | | | |
| Single | 30(46.9) | 34(53.1) | $\chi^2$= 33.648# |
| Married | 99(47.6) | 109(52.4) | p = **<0.001** |
| Divorced | 0(0.0) | 14(100.0) | |
| Separated | 0(0.0) | 14(100.0) | |
| **Educational Level** | | | |
| No formal Education | 2(10.5) | 17(89.5) | $\chi^2$= 22.740# |
| Primary | 29(69.0) | 13(31.0) | p = **<0.001** |
| Secondary | 49(44.5) | 61(55.5) | |
| Tertiary | 49(38.0) | 80(62.0) | |
| **How long have you been vending food** | | | |
| Less than 12 months | 0(0.0) | 11(100.0) | $\chi^2$= 21.871# |
| 1 -3 years | 52(53.6) | 45(46.4) | p = **<0.001** |
| 4-5 years | 22(30.6) | 50(69.4) | |
| Over 5 years | 55(45.8) | 65(54.2) | |
| **Have you undergone any training on food safety and hygiene** | | | |
| Yes | 26(26.3) | 73(73.7) | $\chi^2$= 15.885* |
| No | 103(51.2) | 98(48.8) | p = **<0.001** |

** Continuity Correction, #- Likelihood Ratio*

Food hygiene practices of food vendors were significantly associated with several sociodemographic characteristics. Marital status was significantly associated with hygiene practices ($p < 0.001$), 52.4% of married salespeople and 53.1% of single food vendors showed good practices. Education level was also significantly associated with hygiene practices ($p < 0.001$). Interestingly, the majority of food vendors without formal education (89.5%) showed good practices, followed by 62.0% with higher education. On the other hand, only 31.0% of food vendors with elementary education showed exemplary practices. The length of experience in food retailing had a significant impact on hygiene compliance ($p < 0.001$). All food vendors with less than 12 months of experience (100%) showed exemplary practices, and 69.4% with 4 to 5 years of experience also showed exemplary

practices. Food Vendors with 1 to 3 years of experience showed the lowest level of exemplary practices at 46.4%. Food safety training was significantly associated with hygiene practices ($p < 0.001$). The proportion of trained providers (73.7%) was higher than that of untrained providers (48.8%) (Table 2).

**Table 3.** Binary Logistics Regression of the Outcome Variable, Level of Practices of Food Hygiene among food Vendors "and Selected Sociodemographic Predictor

| Predictor Variables | Categories of Variables | Odds Ratio | p-value | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| **Age** | 16-24 years (Reference) | 5.707 | **0.017** | 1.372 | 23.733 |
| **Sex** | Female (Reference) | 2.217 | 0.125 | 0.802 | 6.130 |
| **Marital Status** | Married (Reference) | 2.458 | 0.109 | 0.819 | 7.376 |
| **Educational Level** | Primary Education (Reference) | 0.243 | 0.123 | 0.040 | 1.470 |
| **How long have you been vending food** | 1 -3 years (Reference) | 1.127 | 0.764 | 0.516 | 2.464 |
| **Have you undergone any training on food safety and hygiene** | Yes (Reference) | 2.182 | **0.018** | 1.145 | 4.159 |

The level of food hygiene practices among food vendors was significantly associated with both age and prior training in food safety and hygiene. Vendors aged 16-24 years had significantly higher odds of better hygiene practices, with an odds ratio of 5.707 (95% CI: 1.372-23.733, p=0.017). Additionally, vendors who had received training in food safety and hygiene were more than twice as likely to practice better food hygiene, with an odds ratio of 2.182 (95% CI: 1.145-4.159, p=0.018). While not statistically significant, vendors with primary education showed lower odds of good hygiene practices compared to those with higher education levels, with an odds ratio of 0.243 (95% CI: 0.040-1.470, p=0.123) (Table 3).

**Table 4.** Observational Checklist

| Variables | Frequency | Percentage |
|---|---|---|
| **What material is the structure made of where the food is sold/ prepared** | | |
| Container | 79 | 26.3 |
| Wooden Table | 200 | 66.7 |
| Iron Table Canopy | 21 | 7.0 |
| **Where is the food prepared** | | |
| Home | 75 | 25.0 |
| On site | 225 | 75.0 |
| **Is vending stall protected from sun and or rain** | | |
| Yes | 270 | 90.0 |
| No | 30 | 10.0 |

| | | |
|---|---|---|
| **Are the animals or pests flies etc. evident around the vending stall** | | |
| Yes | 185 | 61.7 |
| No | 115 | 38.3 |
| **Is potable water available at the site or close to the site** | | |
| Yes | 265 | 88.3 |
| No | 35 | 11.7 |
| **Are there adequate hand washing facilities available** | | |
| Yes | 204 | 68.0 |
| No | 96 | 32.0 |
| **Is the environment around the stall clean** | | |
| Yes | 229 | 76.3 |
| No | | |
| **Does the vendor wash hands before handling, preparing and serving food** | | |
| Yes | 277 | 92.3 |
| No | 23 | 9.7 |
| **Does the vendor handle after each toilet visit** | | |
| Yes | 271 | 90.3 |
| No | 29 | 9.7 |
| **Are the operators‟ clothes clean and presentable** | | |
| Yes | 182 | 60.7 |
| No | 118 | 39.3 |
| **Does the vendor handle money while serving food** | | |
| **Yes** | 192 | 64.0 |
| **No** | 108 | 36.0 |

The observation checklist highlights key elements that emphasize the importance of maintaining a safe and hygienic food preparation environment among food vendors. The majority of the food vendors (66.7%) prepare and serve food on wooden tables, with 75.0% preparing food on site, highlighting the need for hygiene on site. The majority of food stalls (90.0%) are weatherproof, which is necessary to protect food from contamination. Drinking water is readily available at most sites (88.3%) and hand washing facilities are available (68.0%), however, animal presence and pest issues are evident, with 61.7% of stalls experiencing pest activity. Encouragingly, 92.3% of suppliers practice hand washing before handling food, and 90.3% practice hand washing after using the toilet, reflecting their commitment to hygiene. However, there remains the problem that 39.3% of operators are wearing unclean or unsightly clothes, and a significant number (64.0%) are holding money in their hands while serving food, which can lead to contamination.

## Discussion

This study was conducted among food vendors in Osun State and aimed to assess the food hygiene practices of food vendors. The study found that the majority of food vendors in Osun State were women (88.7%). This is consistent with similar studies conducted in African settings where women are primarily engaged in small-scale food vending [16–19]. The age distribution of food vendors, with the majority (47.7%) aged between 25 and 39

years, is consistent with the findings of a study conducted in Uganda where most food vendors were aged between 26 and 40 years [18]. The dominance of women in food trading activities can be explained by the informal nature of the trade. This provides women, especially those who are married or have domestic responsibilities, with flexible working hours and a source of income.

The study also found a significant association between age and food hygiene practices for younger vendors, especially those aged 16–24 ($p = 0.027$). They were found to have higher hygiene practices. This finding is similar with the study by Afolaranmi et al. (2015), who reported that younger food handlers had better food hygiene knowledge and practices compared to older food handlers in Jos, Nigeria [20]. Younger vendors are more receptive to new information and training, which enhances their ability to implement good hygiene practices. Education level was significantly associated with food hygiene practices ($p < 0.001$), with food vendors without formal education demonstrating the highest level of good hygiene practices (89.5%). This result is somewhat surprising, but may be explained by the fact that many vendors without formal education rely heavily on traditional knowledge and experience passed down from generation to generation that may emphasize cleanliness and safety when preparing food. However, vendors with higher education also showed higher levels of compliance (62.0%), indicating that formal education can also play an important role in promoting food safety, which is consistent with the findings of a similar study conducted by Ituma et al. (2019) where education was associated with better food hygiene practices [21].

According to this study's findings, there was significant relationship between food safety and hygiene training and food hygiene practices, with trained vendors being more likely to adhere to good hygiene practices (73.7%) compared to untrained salespeople (48.8%). This is nearly coherent with the findings of Bamidele et al., (2015), who reported that vendors who received formal food safety training had better hygiene practices compared to untrained vendors [22]. Training can help food vendors acquire the knowledge and skills needed to handle food safely, thereby reducing the risk of foodborne illness. Length of experience in food vending was another significant factor influencing hygiene practices ($p < 0.001$). Food vendors with less than 12 months of experience demonstrated the best hygiene practices (100%), followed by those with 4–5 years of experience (69.4%), while those with 1–3 years of experience demonstrated the lowest level of best practices (46.4%). This result is consistent with a study conducted by Germa et al. (2019) in Nigeria, which found that experienced food vendors were more likely to comply with food safety regulations (23). However, the higher compliance rate among new vendors may be due to recent training and greater motivation to follow recommendations when building their business.

The observation checklist provided additional information on the environmental conditions in which food was prepared and sold. Although 90.0% of the stalls were weatherproof and 88.3% of the vendors had access to drinking water, pest control remained a major issue, with flies and other pests found in 61.7% of the stalls. This finding echoes a study conducted by Muyanja et al. (2011) in Uganda, where pest infestation around food stalls was identified as a major challenge to maintaining food safety [18]. The presence of pests increases the risk of infestation, highlighting the need for improved hygiene and pest control measures in food retail outlets. The observation that 64.0% of vendors handled money while serving food is concerning and represents a potential source of contamination. Studies have consistently shown that money, especially in informal markets, can contain

harmful pathogens [21, 24, 25]. This practice increases the risk of cross-contamination as vendors can transfer bacteria from money to food.

The findings of this study have important public health implications. The link between food safety education and good hygiene practices suggests that regular and structured training programs for food handlers can significantly reduce the risk of foodborne illness. Local health authorities should consider introducing mandatory training sessions for all food handlers with regular refresher courses to reinforce best practices. In addition, the presence of pests and money handling practices when serving food indicate a need for infrastructure and training improvements. Retailers should be encouraged to improve counter cleanliness and adopt practices such as employing designated staff to handle money or wear gloves when serving food.

The results of this study are consistent with previous studies in other regions. For example, the higher level of good hygiene practices among trained vendors is consistent with the study conducted by Samapundo et al (2015), which reported that vendors who received food hygiene training were more likely to adhere to safe food handling practices [25]. Similarly, the finding that younger vendors were more likely to practice good hygiene is consistent with a study conducted in Bangladesh by Abid et al. (2022), which found that younger food handlers were more likely to adhere to food safety regulations [26]. However, the results of this study differ from those of Tuglo et al. (2021) in Ghana a higher proportion of establishments with secondary education had better food hygiene practices than those without formal education [27]. This discrepancy may be due to cultural or regional differences in the way food safety knowledge is disseminated, as well as the role of non-formal education in promoting hygiene practices.

The cross-sectional nature of this study limits the ability to establish causal relationships between sociodemographic factors and food hygiene practices. Furthermore, this study was conducted in a specific geographic area, which may limit the generalizability of the results to Nigeria or other parts of Africa. Future research could examine the longitudinal impact of food safety education on hygiene practices and examine the effectiveness of different training methods.

## Conclusion

The findings of this study highlight important factors that influence food hygiene practices among food vendors in Osun State. Age, education, experience, and training play important roles in determining hygiene compliance levels. Targeted interventions, including mandatory food safety education and infrastructure improvements, are essential to improve food safety standards. Policymakers and public health professionals should prioritize these measures to reduce the risk of foodborne illness and improve overall population health outcomes.

### Study Limitation

Limitations of this study include possible response bias. This is because sellers may already be reporting socially desirable hygiene practices. Additionally, recall bias may affect accuracy. This is because participants may not accurately recall details of their practice or coaching experience. Although honest answers are encouraged.

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## Conflict of Interest

The Authors declare no conflict of interest.

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