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Microbiological Quality and Food Safety of Frozen Chicken Cuts Marketed in Siguiri, Guinea: A Cross-Sectional Study

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Abstract

Background: Frozen chicken cuts are widely marketed in Siguiri, Guinea, but their microbiological quality has not been adequately documented. This study assessed the microbiological contamination of frozen chicken cuts sold in three markets in Siguiri.

Methods: A descriptive cross-sectional study with an analytical component was conducted from February to March 2025 in Central Market, Doko Market, and Kintinia Market. Forty-five samples were collected using purposive sampling: 14 from Kintinia, 14 from Doko, and 17 from Central Market. Microbiological analyses targeted total bacterial flora, coliforms, streptococci, Staphylococcus aureus, and yeasts. Data were analyzed using Microsoft Excel and SPSS.

The manuscript reports the use of the chi-square test, with statistical significance set at 5%.

Results: Among the 45 frozen chicken samples analyzed, the prevalence of microbiological contamination varied significantly across the three markets.

Kintinia Market had the highest proportions of samples positive for total bacterial flora (9/14; 64.3%), coliforms (12/14; 85.7%), streptococci (11/14; 78.6%), and yeasts (14/14; 100%).

At Central Market, Staphylococcus aureus was detected in 11/17 samples (64.7%), whereas no positive samples were reported for this microorganism at Kintinia or Doko. Doko Market showed lower detection rates for total bacterial flora (1/14; 7.1%) and streptococci (2/14; 14.3%). The reported statistical comparisons indicated significant differences among markets for total bacterial flora ($p = 0.0053$), coliforms ($p < 0.001$), streptococci ($p < 0.001$), S. aureus ($p < 0.001$), and yeasts ($p < 0.001$).

Conclusion: Microbiological contamination was detected in frozen chicken cuts from the three markets, with different patterns across markets. These findings support the need for stronger microbiological surveillance and improved hygiene and storage practices. Because storage temperatures in the markets were not continuously monitored and the study did not measure illness among consumers, the findings do not establish the causes of contamination or demonstrate clinical health outcomes.

Keywords: Frozen Chicken Cuts, Microbiological Quality, Microbiological Contamination, Food Safety, Guinea

1. Introduction

Poultry meat is an important source of animal protein and contributes to food and nutritional security.

Frozen chicken is widely consumed because of its affordability, availability, and convenience.

Its microbiological quality can be affected by contamination during processing, transport, storage, handling, and retail sale;

appropriate temperature control and hygiene practices are therefore important throughout the distribution chain (FAO, 2020).

Poultry products may carry microorganisms of public-health or hygiene significance when contaminated or handled under inadequate conditions. Studies from African markets have reported microbiological contamination in frozen poultry.

In Nigeria, Oluwafemi *et al*. (2020) reported contamination of frozen chicken samples with aerobic mesophilic bacteria and coliforms.

In Ghana, Adu-Gyamfi *et al*. (2019) reported the isolation of microorganisms, including *Salmonella* spp. and *Staphylococcus aureus*, from frozen poultry products.

These findings provide a regional context for examining the microbiological quality of poultry sold in local markets.

In Siguiri, Guinea, frozen chicken cuts are available in local markets, but published evidence on their microbiological quality appears limited. This local evidence gap makes it difficult to characterize contamination patterns across markets and to identify priorities for food-safety monitoring.

The present study therefore assessed the microbiological contamination of frozen chicken cuts marketed in Central Market, Doko Market, and Kintinia Market. We hypothesized that the proportions of samples positive for the microorganisms tested would differ among the three markets.

As this was a cross-sectional study, observed differences were not interpreted as proof of specific causes, such as cold-chain failure.

2. Methodology

2.1 Study design and setting

This descriptive cross-sectional study with an analytical component was conducted in Siguiri Prefecture, Republic of Guinea, from 1 February to 31 March 2025. The study assessed the microbiological quality of frozen chicken cuts marketed in the three main markets. Although storage and handling conditions were considered among the study variables, the manuscript does not provide complete measurements for all such conditions.

2.2 Study area

The study was conducted in the Siguiri Health District, which falls under the Regional Health Inspectorate of Kankan in the Republic of Guinea. The district comprises one urban municipality and twenty rural municipalities.

The Siguiri Health District covers an area of approximately 18,500 km². It is bordered by the Mandiana Health District to the east, Dinguiraye to the west, Kankan to the south, Kouroussa to the southwest, and the Republic of Mali to the north.

According to the 2024 General Population and Housing Census (RGH 2024), the district has an estimated population of 902,465 inhabitants, of whom approximately 82.86% live in rural areas. The population is characterized by high mobility, largely driven by artisanal gold mining activities.

The study was specifically conducted in the three main markets of Siguiri City: Central Market, Doko Market, and Kintinia Market.

2.3 Study population

The study population consisted of frozen chicken cuts intended for human consumption, including drumsticks, wings, and fillets, marketed in the selected markets during the study period.

2.4 Inclusion and exclusion criteria

Frozen chicken drumsticks, wings, and fillets available for sale in the selected markets during the data collection period (February to March 2025) were included in the study.

Products sold outside the three selected markets, as well as poultry products other than the targeted chicken cuts, were excluded.

2.5 Sampling procedure and sample size

A purposive sampling strategy was used to include frozen chicken cuts available at retail outlets in the three selected markets.

A total of 45 samples, each weighing approximately 100 g, were collected: 14 from Kintinia Market, 14 from Doko Market, and 17 from Central Market. The available study record does not specify the exact procedure used to select individual retailers or whether more than one sample was collected from the same retailer.

2.6 Data collection and laboratory materials

2.6.1 Sample collection

Samples were purchased directly from retailers using aseptic procedures.

Approximately 100 g of each sample was collected using sterile equipment, including sterile stomacher bags, sterile gloves, insulated coolers containing ice packs, and a digital thermometer for temperature monitoring.

Immediately after collection, samples were transported under refrigerated conditions and maintained at ≤4°C until laboratory analysis. This temperature refers to transport and does not establish that the products were continuously maintained at the recommended frozen-storage temperature at the markets. Continuous monitoring of market storage temperatures was not documented.

2.6.2 Culture media

Microbiological analyses were performed using culture media appropriate for the target microorganisms. Plate Count Agar (PCA) was used for enumeration of the total aerobic mesophilic flora, MacConkey agar for the isolation of Enterobacteriaceae, Chapman agar for the detection of staphylococci, and Salmonella-Shigella (SS) or Xylose Lysine Deoxycholate (XLD) agar for the isolation of *Salmonella* spp.

2.6.3 Microbiological parameters

The microbiological analyses included enumeration of the total aerobic mesophilic flora, total coliforms, and fecal coliforms, as well as the detection of *Escherichia coli*, *Salmonella* spp., and *Staphylococcus aureus*.

2.6.4 Microbiological procedures

Microbiological analyses used culture-based procedures involving surface or pour-plate inoculation, followed by incubation at 37°C for 24–48 hours. Colony counts were expressed as colony-forming units per gram (CFU/g). Initial characterization included Gram staining and the oxidase test. Gram-negative, oxidase-negative bacilli were subjected to additional biochemical tests; where available, bacterial identification was confirmed using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS).

No formal microbiological acceptance criteria were applied; therefore, the samples were not classified as

microbiologically compliant or non-compliant.

2.7 Study Variables

The dependent variables were the level of microbiological contamination of frozen chicken cuts and the presence of pathogenic microorganisms.

Independent variables included storage conditions, storage temperature, hygienic conditions of retail outlets, handling practices, and storage duration.

2.8 Data Analysis

Data were entered, coded, and analyzed using Microsoft Excel and IBM SPSS Statistics.

Descriptive analyses included frequencies and percentages; means and standard deviations were calculated where relevant. The manuscript reports that the chi-square test was used for categorical comparisons and that Student's t-test or analysis of variance (ANOVA) could be used for continuous variables when appropriate. However, the specific variables analyzed with each test, the test applied to each table, and the checks of statistical assumptions were not documented in sufficient detail. These should be specified after reanalysis of the dataset. The stated significance threshold was $p < 0.05$. The microbiological standard or guideline used to interpret acceptability must be named explicitly; this information is not provided in the current manuscript.

2.9 Ethical Considerations

The anonymity of retailers was maintained, and collected data were used for scientific purposes.

The source manuscript does not identify an ethics committee, an approval number, or whether formal ethical review was obtained. The authors should add the verified committee name and approval reference, if applicable. If formal review was not required or was waived, the manuscript should state the documented basis for that decision; an approval number must not be invented.

3. Results

Table 1: Microbiological contamination of frozen chicken cuts according to market in Siguiri, Republic of Guinea.

Market	Samples (n)	Bacterial flora n (%)	Coliforms n (%)	Streptococci n (%)	S. aureus n (%)	Yeasts n (%)
Kintinia	14	9 (64.3)	12 (85.7)	11 (78.6)	0 (0.0)	14 (100.0)
Doko	14	1 (7.1)	0 (0.0)	2 (14.3)	0 (0.0)	0 (0.0)
Central Market	17	5 (29.4)	0 (0.0)	0 (0.0)	11 (64.7)	0 (0.0)
p-value	—	0.0053	< 0.001	< 0.001	< 0.001	< 0.001

Analysis of the 45 frozen chicken samples revealed variations in microbiological contamination across the three markets in Siguiri.

Overall, bacterial flora was detected in 33.3% of samples, coliforms in 26.7%, streptococci in 28.9%, Staphylococcus aureus in 24.4%, and yeasts in 31.1%.

Kintinia showed the highest contamination rates for coliforms (85.7%), streptococci (78.6%) and yeasts (100%), whereas the Central Market had the highest prevalence of S. aureus (64.7%).

Doko generally exhibited lower contamination rates.

Statistically significant differences were reported across markets for all five microbiological parameters ($p = 0.0053$ for bacterial flora and $p < 0.001$ for the other parameters) suggesting that contamination patterns varied according to the market.

4. Discussion

4.1 Overall microbiological contamination

This study assessed the microbiological contamination of frozen chicken cuts marketed in three markets in Siguiri, Republic of Guinea. Among the 45 samples analyzed, bacterial flora was detected in 33.3%, coliforms in 26.7%, streptococci in 28.9%, *Staphylococcus aureus* in 24.4%, and yeasts in 31.1%.

These findings indicate the presence of several microbial groups in the sampled products.

However, the detection of these microorganisms does not, by itself, establish the presence of foodborne illness or quantify the risk to consumers. Food safety depends on the microorganisms involved, their concentrations, and the conditions under which contaminated food is handled and consumed (World Health Organization, 2024) [6].

4.2 Differences in contamination across markets

The results revealed statistically significant differences among markets for all five microbiological parameters. The difference in bacterial flora was significant ($p = 0.0053$), while coliforms, streptococci, *S. aureus*, and yeasts were reported at $p < 0.001$. These findings suggest that the distribution of the detected microorganisms varied according to the market.

Kintinia had the highest proportions of coliforms (85.7%), streptococci (78.6%), and yeasts (100%). Bacterial flora was detected in 64.3% of samples, whereas *S. aureus* was not detected. The high detection frequencies suggest that the sampled chicken cuts at this market had a distinct microbiological profile.

These findings warrant further investigation of handling practices, sanitation, storage conditions, and temperature control. However, because these factors were not directly measured, their contribution to the observed contamination cannot be established. The Codex Alimentarius Commission (2005) [1] emphasizes the importance of appropriate hygiene and temperature control throughout the meat production, handling, and storage chain.

4.3 Contamination at the central market

At the Central Market, bacterial flora was detected in 29.4% of samples, while *S. aureus* was detected in 64.7%. No coliforms, streptococci, or yeasts were detected in the samples collected at this market. The relatively high frequency of *S. aureus* detection deserves attention because this bacterium can contaminate food through human handling, equipment, and environmental contact. Certain strains can produce enterotoxins responsible for food poisoning (U.S. Food and Drug Administration, 2012) [4].

Nevertheless, the present study did not investigate contamination sources, quantify bacterial loads, or test for enterotoxins. Therefore, the detection of *S. aureus* should be interpreted as a microbiological finding rather than direct evidence that the sampled chicken cuts contained enterotoxins or had caused foodborne illness.

4.4 Microbiological findings at Doko market

Doko had the lowest proportion of samples positive for bacterial flora (7.1%), while streptococci were detected in 14.3% of samples. No coliforms, *S. aureus*, or yeasts were detected. These results suggest a different contamination profile compared with Kintinia and the Central Market. However, the absence of detection does not necessarily demonstrate that the products were free from these microorganisms, particularly given the relatively small sample size. Further research incorporating direct observations of hygiene practices and systematic monitoring of storage temperatures would help clarify the factors underlying these differences.

4.5 Public health implications

The findings highlight the importance of strengthening microbiological surveillance and hygiene practices in the three markets. The detection of microbial groups in frozen chicken cuts warrants attention because poultry products can serve as vehicles for foodborne pathogens when contamination occurs during production, handling, storage, or preparation (WHO, 2024) [6].

Particular attention should be given to hygienic handling, cleaning and disinfection of equipment, prevention of cross-contamination, and maintenance of appropriate freezing and storage temperatures.

The observed differences between markets may help guide future surveillance and targeted hygiene interventions. However, the study did not assess consumer illness or directly measure market-level hygiene and temperature conditions. Consequently, it cannot establish a causal relationship between market practices and contamination or quantify the resulting health burden.

4.6 Study limitations

This study has several limitations.

First, the sample comprised only 45 chicken cuts collected from three markets, limiting the generalizability of the findings.

Second, the study did not provide direct measurements of storage temperatures, duration of storage, or specific hygiene practices. Third, the results were reported as detection frequencies without quantitative microbial loads, limiting comparisons with microbiological standards.

Finally, the reported *p*-values should be verified against the original dataset and the statistical tests used, particularly because some cells contained zero observations and the sample sizes were small. Exact statistical methods may be more appropriate in these circumstances.

Future studies should include larger and more representative samples, validated microbiological methods, quantitative microbial counts, systematic temperature monitoring, and detailed assessments of handling practices. Such improvements would support more reliable comparisons between markets and a stronger assessment of the microbiological quality of frozen poultry products.

5. Conclusion

This study assessed the microbiological contamination of frozen chicken cuts marketed in the main markets of Siguiri, Republic of Guinea, between February and March 2025. The results showed the presence of several microbial groups among the 45 samples analyzed, with significant differences across markets. Bacterial flora was detected in 33.3% of samples, coliforms in 26.7%, streptococci in 28.9%, Staphylococcus aureus in 24.4%, and yeasts in 31.1%. The reported differences were statistically significant for bacterial flora ($p = 0.0053$) and for the other four microbiological parameters ($p < 0.001$).

Kintinia had the highest detection frequencies for coliforms (85.7%), streptococci (78.6%), and yeasts (100%), whereas the Central Market had the highest proportion of samples positive for S. aureus (64.7%). Doko showed lower detection frequencies overall, with no coliforms, S. aureus, or yeasts detected. These findings demonstrate variations in the microbiological profiles of frozen chicken cuts across the three markets. However, the study did not directly measure storage temperatures, handling practices, or consumer health outcomes; therefore, it cannot establish the causes of contamination or quantify the associated health risks.

6. Contribution and implications of the research

This study provides local evidence on the microbiological quality of frozen chicken cuts marketed in Siguiri, contributing to the documentation of food safety concerns in Guinea. Its findings may help inform local health authorities and veterinary services in planning microbiological surveillance, promoting good hygiene practices, and improving the monitoring of frozen poultry products.

From a public health perspective, the detection of different microbial groups highlights the importance of appropriate handling, sanitation, prevention of cross-contamination, and maintenance of suitable storage temperatures throughout the distribution chain. Nevertheless, further investigations are needed to determine the significance of the detected microorganisms and their potential implications for consumer health.

Future research should involve larger and more representative samples, quantitative microbiological analyses, systematic monitoring of storage temperatures, and direct assessments of hygiene practices. The reported p-values should also be verified against the original dataset and the statistical methods used before definitive conclusions are drawn. Such studies would provide stronger evidence to guide targeted interventions and improve the microbiological safety of frozen poultry products in Siguiri and other local markets.

7. Conflict of interest

The authors declare that they have no conflict of interest related to this study. The study design, data collection, analysis, and interpretation of results were conducted independently, without the influence of commercial, financial, or personal interests that could have affected the findings or their interpretation.

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