

ORIGINAL ARTICLE

Epidemiological characteristics of foodborne diseases in patients treated at a hospital in Colombia

Erica Marcela Aranguren Reina^{1,a} , Edith Yadira Avella Roa^{2,b} , Lorena García Agudelo^{3,c}

¹ Hospital Regional de la Orinoquía, Uniboyacá, Yopal, Colombia.

² Hospital Regional de la Orinoquía, Fundación Universitaria del Área Andina, Yopal, Colombia.

³ Hospital Regional de la Orinoquía, Universidad Rey Juan Carlos Yopal, Colombia.

^a Specialist in Epidemiology.

^b Specialist in Senior Management.

^c Master's degree in HIV.

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ABSTRACT

Objective. To characterize the epidemiology of foodborne diseases (FBDs) in patients treated at a hospital in Colombia. **Methods.** A descriptive observational study was conducted. All patients with a diagnosis of foodborne disease reported between 2014 and 2024 were included. Data were obtained from the Hospital's notification database, compiled within the framework of Colombia's Public Health Surveillance System (SIVIGILA, by its Spanish acronym). **Results.** A total of 195 notifications of patients treated at the Hospital were recorded. The mean age was 20.8 years (SD: 15.1), and 53.8 % were female. The year with the highest number of notifications was 2015 (17.9 %), whereas 2020 had the lowest proportion (2.0 %). One in two cases required hospitalization. It was found that 71.4 % of the implicated foods were preparations based on animal protein requiring complex handling. In addition, 66% of cases reported meat consumption at home. The etiologic agent was identified in only two cases, corresponding to *Escherichia coli*, *Salmonella spp.*, and *S. Paratyphi*. **Conclusions.** The findings highlight the need to strengthen community-level education on food hygiene, as well as to expand diagnostic capacity for the timely detection of causative microorganisms.

Características epidemiológicas de las enfermedades transmitidas por alimentos en pacientes atendidos en un hospital de Colombia

Palabras clave:

enfermedades transmitidas por los alimentos; inocuidad de los alimentos; incidencia; salud pública; epidemiología (fuente: DeCS-BIREME).

RESUMEN

Objetivo. Caracterizar epidemiológicamente las enfermedades transmitidas por alimentos (ETA) en pacientes atendidos en un hospital de Colombia. **Métodos.** Estudio observacional descriptivo. Se incluyeron todos los pacientes con diagnóstico de ETA notificados entre 2014 y 2024. Los datos fueron obtenidos de la base de notificaciones del Hospital, consolidada en el marco del SIVIGILA (Sistema de Vigilancia en Salud Pública de Colombia). **Resultados.** Fueron registradas 195 notificaciones de pacientes atendidos en el Hospital. La media de edad fue de 20,8 años (DE: 15,1); el 53,8 % correspondió al sexo femenino. El año con mayor número de notificaciones fue 2015 (17,9 %), mientras que 2020 presentó la menor proporción (2,0 %). Uno de cada dos casos requirió Hospitalización. Se identificó que el 71,4 % de los alimentos implicados eran preparaciones a base de proteína animal que requieren manipulación compleja. Además, el 66 % de los casos refirió consumo de carnes en el hogar. Solo en dos casos se logró identificar el agente etiológico, correspondiendo a *Escherichia coli*, *Salmonella spp.* y *S. Paratyphi*. **Conclusiones.** Los hallazgos evidencian la necesidad de fortalecer la educación en higiene alimentaria a nivel comunitario, así como de ampliar las capacidades diagnósticas para la detección oportuna de microorganismos causales.

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Correspondence:

Erica Marcela Aranguren Reina

ericaranguren@gmail.com



INTRODUCTION

Foodborne diseases (FBDs) are conditions that occur after the consumption of food or water contaminated with microorganisms such as viruses, bacteria, parasites, or toxic chemicals. They may result from various forms of environmental contamination, including pollution of water, soil, or air, as well as from unsafe food storage and processing. Symptoms may be mild or require medical care; the most common include vomiting, diarrhea, abdominal pain, fever, and headache, which may persist for a few hours or days after consuming contaminated food. In some cases, severe systemic manifestations may occur and can lead to death ^(1,2). Most of these diseases are self-limiting and resolve with rehydration, although antibiotics are used in certain cases. Antibiotic resistance and disruption of the microbiome should also be taken into consideration ^(3,4).

The socioeconomic impact resulting from productivity losses and pressure on healthcare systems makes FBDs a public health problem. They contribute to the global burden of morbidity and mortality across all age groups. In low- and middle-income countries, however, 40% of cases affect children younger than 5 years ^(5,6). FBDs can be classified into two categories: intoxications and infections. Intoxications are caused by chemical or natural toxins; some are naturally occurring, such as aflatoxins, and are produced by fungi including *Aspergillus* spp. and *Penicillium* spp., which grow in food, particularly stored cereals. Aflatoxin ingestion may have harmful effects on the liver, brain, and kidneys and may even lead to cancer ⁽⁷⁻⁹⁾. Ciguatera poisoning also results mainly from the accidental ingestion of fish contaminated with toxins produced by two genera of dinoflagellates, *Gambierdiscus* spp. and *Fukuoya* spp. ^(10,11).

Infections result from the consumption of food containing high concentrations of pathogenic microorganisms, such as *Escherichia coli*, *Listeria monocytogenes*, *Staphylococcus aureus*, *Shigella* spp., *Campylobacter jejuni*, *Pseudomonas aeruginosa*, *Salmonella Typhi*, *Salmonella Paratyphi*, hepatitis A virus, among others ⁽¹²⁾. Each year, more than 600 million people become ill and 420,000 die as a result of consuming contaminated food ^(13,14). In particular, *Campylobacter* spp. is associated with approximately 500 million infections annually. In contrast, *Salmonella* (*S. Typhi*) is responsible for more than 90 million foodborne illnesses and is considered the third leading cause of death worldwide each year ⁽¹⁵⁻¹⁸⁾.

In the European Union One Health context, a total of 5,691 FBD outbreaks were recorded in 2023, involving 52,127 cases and 65 deaths, representing the highest rate in the previous 10 years. The foods of greatest relevance were eggs or foods containing eggs, as well as high-protein foods such as meat and poultry. Similarly, the main microorganisms identified were *Salmonella* spp., *Bacillus cereus*, and norovirus ⁽¹⁹⁾.

In the Region of the Americas, 77 million people experience FBDs each year and more than 9,000 die as a result. These diseases are preventable, and their burden can be reduced by strengthening inspection, surveillance, and control activities carried out by authorities throughout the food chain up to the point of consumption. In Latin America and the Caribbean, between 2015 and 2020, Ecuador reported 113,695 cases of FBDs; the Amazon regions had the highest rates, with hepatitis A-related foodborne illness standing out as the most frequent etiology ^(20,21). In Colombia, in 2024, the National Institute of Health reported 687 outbreaks involving 7,753 cases and three deaths; the most frequently detected etiological agents were *E. coli*, fecal coliforms, and *S. aureus* ⁽²²⁾.

This study is important because it helps identify trends, causes of foodborne diseases, types of implicated foods, places where they are consumed, and factors associated with these diseases, considering that information on these conditions remains limited in the region. Accordingly, the objective of this study was to epidemiologically characterize foodborne diseases among patients treated at a hospital in Colombia.



METHODS

Study type and population

This was an observational, descriptive study conducted at Hospital Regional de la Orinoquía, Casanare, Colombia. All patients reported to the public health surveillance system with a foodborne disease (FBD) event between 2014 and 2024 were selected. A total of 199 cases were reported, of which two were excluded: one because of a data-entry error and another because of an update. The final census population consisted of 195 reported cases. All patients with a confirmed diagnosis were included, whereas cases presenting only clinical suspicion without diagnostic confirmation were excluded.

Variables and data collection instruments

Sociodemographic variables included age, sex, nationality, place of origin, and place of residence.

Temporal variables included year of notification. Clinical variables included symptoms, hospitalization, implicated foods, place of consumption, association with an outbreak, relationship with exposure, type of specimen, identified microbiological agent, and outcome.

Data collection techniques and procedures

Data were obtained from the hospital’s FBD notification database, compiled within the framework of SIVIGILA (Public Health Surveillance System), Colombia’s national system for the observation, collection, analysis, and dissemination of information on events of public health interest, including infectious, chronic, and emerging conditions.

Notification forms allow the reporting of cases that meet the operational case definition for FBD, corresponding to any person who develops symptoms after consuming food or water suspected of being contaminated, supported by epidemiological evidence or laboratory analysis. Clinical manifestations include nausea, vomiting, abdominal pain, diarrhea, headache, among others ⁽²²⁾.

Data analysis

The normality of quantitative variables was assessed using the Shapiro–Wilk test, with a significance level of $p < 0.05$. Variables with a normal distribution were described using the mean and standard deviation, whereas those with a non-normal distribution were summarized using the median and interquartile range (IQR). Data processing was performed using Microsoft Excel® 2022 and SPSS®, 2017 version.

Ethical considerations

The study complied with the principles of the Declaration of Helsinki and national regulations governing health research. Confidentiality of the information was ensured through the use of anonymized databases. The study was approved by the Hospital Research Ethics Committee as documented in Minutes No. 35, dated September 15, 2025.

 RESULTS

A total of 195 notifications of individuals treated for FBD were obtained between January 1, 2014, and December 31, 2024. The mean age of patients treated for FBD was 20.8 years (± 15.1), with a range of 1–76 years (IQR: 8–30). Regarding sex distribution, 53.8% ($n = 105$) were female. Regarding place of origin, 83.6% ($n = 163$) of cases came from the municipal urban area, 7.7% ($n = 15$) from population centers, and 8.7% ($n = 17$) from dispersed rural areas. In terms of health insurance coverage, 48.2% ($n = 94$) belonged to the contributory scheme, 43.6% ($n = 85$) to the subsidized scheme, and 4.6% ($n = 9$) were uninsured. With respect to ethnicity, 1.5% ($n = 3$) were Indigenous and 98.4% ($n = 192$) belonged to another ethnic group.

Regarding the distribution of case notifications by year, as presented in Table 1, 2015 had the highest frequency, with 17.95% ($n = 35$), whereas 2020 had the lowest frequency, with 2.1% ($n = 4$) (Table 1).

Table 1. Distribution of reported cases of foodborne diseases at Hospital Regional de la Orinoquía, Colombia, 2014–2024

Year	Cases	%
2014	24	12.3
2015	35	17.9
2016	25	12.8
2017	14	7.2
2018	28	14.4
2019	19	9.7
2020	4	2.1
2021	19	9.7
2022	6	3.1
2023	13	6.7
2024	8	4.1
Total	195	100

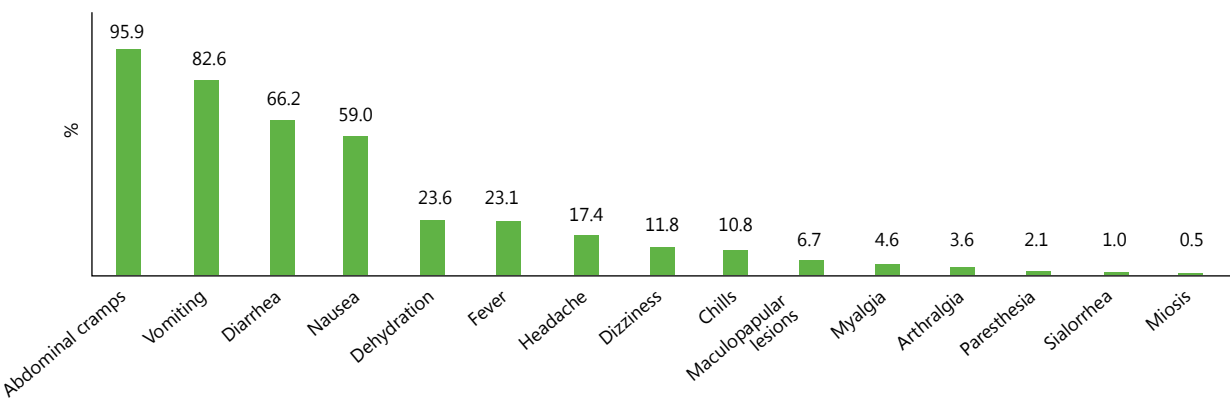


Figure 1. Clinical manifestations of foodborne disease cases at Hospital Regional de la Orinoquia, Colombia, 2014–2024

Among the relevant population groups, 3.6% (n = 7) were pregnant women between 8 and 37 weeks of gestation and 5.5% (n = 5) were migrants; the remaining group, equivalent to 93.8% (n = 183), was classified under the “other” category.

Regarding hospitalization, one in two cases (48.7%) required hospital admission for more than 24 hours due to the severity of the infection.

The distribution and frequency of the reported clinical manifestations are presented in Figure

1. Abdominal cramps, vomiting, diarrhea, and nausea were the most frequent symptoms among the reported cases. In contrast, the least common manifestations were those involving neurological alterations, such as paresthesias, arthralgias, and myalgias.

In the analysis of foods implicated in FBD cases, the 14 foods with the highest proportions were identified. Of these, 71.4% were prepared with animal protein and required complex handling (Table 2).

Table 2. Foods implicated in foodborne diseases among patients treated at Hospital Regional de la Orinoquia, Colombia, 2014–2024

Implicated food	Cases	(%)
Chicken and rice	30	15.5
Sancocho	13	6.7
Chicken pie	10	5.1
Hot dog	8	4.1
Roast chicken	8	4.1
No data	7	3.6
Chorizo	5	2.6
Colombian-style scrambled eggs (<i>huevos pericos</i>)	5	2.6
Juices	5	2.6
Grilled beef	4	2.1
Pork	4	2.1
Empanada	4	2.1
Hamburger	4	2.1
Tres leches cake	4	2.0
Other	84	43.0
Total	195	100

Regarding the association between FBD cases and places of consumption, the highest proportion occurred in the home, accounting for 43.6% (n = 85), followed by restaurants at 16.4% (n = 32) and bakeries at 11.3% (n = 22). Likewise, 6.7% (n = 13) were associated with educational institutions, 3.6% (n = 7) with street food vendors, and one isolated case (0.5%) with a military base that was not associated with any outbreak; 17.9% (n = 35) had no available data. It is noteworthy that 94.8% (n = 185) were diners, 3.5% (n = 7) were food handlers, and 1.5% (n = 3) had no available data.

The consumption of poultry and meat at home accounted for 66.1% (n = 129), making the home the place of consumption with the greatest risk for acquiring an FBD. Intrinsic conditions were associated with poor hygienic practices that favored microbial growth, as well as with the combination of high-risk foods with ready-to-eat foods and preparations left at room temperature for prolonged periods. The city where the study was conducted had an average temperature of 30 °C and humidity of 69%.

Regarding the biological samples obtained for this study, specimen collection was achieved in only 18 cases. Of these, 8.2% (n = 16) corresponded to stool samples and 2.0% (n = 4) to blood samples. Based on the analysis of the implicated foods, etiological agents were identified in two cases (1.5%; n = 2), corresponding to *Escherichia coli*, *Salmonella* spp., and *Salmonella Paratyphi*. The foods implicated in these biological detections were hot dogs, chicken pie, and one case with no available data. No deaths were reported during the years reviewed.

DISCUSSION

This study described the epidemiological characteristics of foodborne diseases occurring between 2014 and 2024 among patients treated at a hospital in Colombia. Cases were concentrated mainly in a young population, with a median age of 20 years, and females predominated at 46.2%. Pregnant women also represented a notable population group in the results. These findings are consistent with the 2024 epidemiological bulletin of the National Institute of Health ⁽²²⁾, in which the highest frequency of cases occurred among individuals aged 20 to 30 years. In contrast, males showed a slightly higher proportion at 53.8%, compared with 46.2% among females.

The predominant clinical manifestations were abdominal cramps (95.9%), vomiting (82.6%), diarrhea (66.2%), and nausea (59.0%), and nearly half of the cases required hospitalization. In contrast, in a study conducted in Ecuador, Ochoa et al. ⁽²³⁾ reported diarrhea (65%) and abdominal pain (54%) as the most frequent symptoms, while 20% of cases required hospitalization.

The implicated foods showed that most cases involved foods of animal origin that also required extensive handling. This is consistent with the World Health Organization (WHO) ⁽²⁴⁾, which recognizes these foods as high-risk products for the occurrence of individual FBD cases or outbreaks. Similarly, the Codex Alimentarius identifies high-risk foods according to intrinsic characteristics such as hydrogen ion concentration and water activity, factors that favor the proliferation of pathogenic microorganisms. National and international governmental agencies emphasize that food safety, nutrition, and food security are closely interrelated. Accordingly, preventive measures such as cleaning, separation of foods, thorough cooking, temperature control, and the use of safe water and raw materials are essential to reduce the risk of contamination and the occurrence of FBD outbreaks ^(25–27).

Causative agents use food, including water, as vehicles of transmission. In sporadic cases of FBD, the source can rarely be identified because, during patient interviews, individuals often do not remember which foods they consumed hours or days before symptom onset. In addition, biological specimens may no longer be available at the time of consultation. The microorganisms detected in FBD cases in this study showed a prevalence of 1.0% for *Salmonella* spp., *Salmonella Paratyphi*, and *E. coli*. Although detection was low, comparison with other studies showed agreement with a systematic review by Severino et al. ⁽²⁸⁾, which reported *Salmonella* spp. as the most prevalent agent, at 38.0%, associated with the consumption of undercooked poultry meat and raw eggs. In the study by Apruzzese et al. ⁽²⁹⁾, an interesting finding was a 22% increase in the detection of fluoroquinolone-resistant *Salmonella* spp. between 2015 and 2024, associated with unregulated antimicrobial use in poultry farms.

This study highlights the association between place of consumption and implicated foods, particularly preparations based on animal protein that require rigorous handling in the home, making the household the main place associated with FBD occurrence, at

43.6%. When compared with the findings of a study conducted in Magdalena, Colombia, a difference was observed in the type of food consumed, since dairy products accounted for 45.5% in that study. Nevertheless, both studies identified the home as the predominant place of consumption associated with FBD occurrence ^(29,30).

One of the main strengths of this study is the inclusion of all patients treated at the hospital over a 10-year period who had a confirmed FBD. This made it possible to identify epidemiological characteristics, causative agents, high-risk foods, and settings in which public health strategies for food handling should be strengthened.

However, this study had limitations related to its retrospective, single-center design. Another limitation was incomplete completion of the epidemiological notification forms, which prevented the analysis of some sociodemographic variables and the identification of the causative agent. This information is essential for linking pathogens with implicated foods and thereby strengthening strategies to improve food safety.

Conclusions

This study showed that FBD cases treated at the hospital during the 10-year study period occurred mainly among females, with an age range of 1–76 years, and predominantly among individuals from urban areas. Likewise, 2015 had the highest number of cases, whereas 2020, when the COVID-19 pandemic began, had the lowest number of notifications. Half of the cases required hospitalization. These foodborne illnesses were associated with animal protein-based foods, such as chicken and rice, which were prepared in households. However, seafood restaurants and bakeries offering egg-based and high-moisture products were also relevant. The most frequently reported clinical manifestations were abdominal cramps, vomiting, diarrhea, and nausea. No deaths related to this public health event were reported.

These findings indicate the importance of strengthening community education on food hygiene, increasing opportunities for diagnostic testing, and improving the capacity to detect microorganisms. These measures are intended to reduce the clinical and epidemiological impact of foodborne diseases in the region.

The limitations of this study included information bias, as data from epidemiological notification forms

may contain inaccurate information due to errors during data entry into the SIVIGILA system. Therefore, review of clinical records was essential. Another limitation was the low identification rate of etiological agents, which prevented more detailed statistical analyses or the identification of causal associations. In addition, lower notification was observed during 2020 in relation to the COVID-19 pandemic, which may have resulted in underreporting during that period. Finally, because this was a descriptive study conducted at a single institution, the findings do not necessarily reflect the overall behavior of the event and therefore limit extrapolation to the regional level.

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BIBLIOGRAPHIC REFERENCES

1. World Health Organization. Foodborne diseases [Internet]. Geneva: WHO; 2024 [cited 2025 Sep 14]. Available from: https://www.who.int/es/health-topics/foodborne-diseases#tab=tab_1
2. Rosso F, Rebellón SD, Llanos TJ, Hurtado BLJ, Ayerly L, Suárez JH, et al. Clinical and microbiological characterization of *Salmonella* spp. isolates from patients treated in a university Hospital in South America between 2012–2021: a cohort study. *BMC infectious diseases* [Internet]. 2023 [cited 2025 Sep 14];23(1):625. doi: 10.1186/s12879-023-08589-y
3. Fleckenstein JM, Matthew Kuhlmann F, Sheikh A. Acute Bacterial Gastroenteritis. *Gastroenterol Clin North Am.* [Internet]. 2021. [cited 2025 Sep 14];50(2):283–304. doi: 10.1016/j.gtc.2021.02.002
4. Molina A, Thye T, Muñoz VL, Zamora SR, Chercos DH, Hernández RR, et al. Molecular characterization of antibiotic-resistant *Salmonella enterica* across the poultry production chain in Costa Rica: A cross-sectional study. *International Journal of Food Microbiology*. [Internet]. 2024 [cited 2025 Sep 15];416(2). doi: 10.1016/j.ijfoodmicro.2024.110663
5. Wu G, Yuan Q, Wang L, Zhao J, Chu Z, Zhuang M, et al. Epidemiology of foodborne disease outbreaks from 2011 to 2016 in Shandong Province, China. *Medicine (Baltimore)* [Internet]. 2018 [cited 2025 Sep 27];97(45). doi: 10.1097/MD.00000000000013142
6. Rojas J, Chacón M, Castañeda L, Díaz A. Cuantificación de aflatoxinas carcinogénicas en alimentos no procesados y su implicación para el consumo en Lima, Perú. *Nutr. Hosp.* [Internet]. 2021 [cited 2025 Sep 15];38(1):146–151. doi: 10.20960/nh.03240
7. Shan X, Williams WP. Toward elucidation of genetic and functional genetic mechanisms in corn host resistance to *Aspergillus flavus* infection and aflatoxin contamination. *Front Microbiol.* [Internet]. 2014 [cited 2025 Sep 15];5(364):1–7. doi: 10.3389/fmicb.2014.00364
8. Teshome E, Forsido S, Rupasinghe H, Olika K, Eteshome E. Potentials of natural preservatives to enhance food safety and shelf life: A review. *The Scientific World Journal* [Internet].

2022. [cited 2025 Sep 15];9901018:1-11 <https://doi.org/10.1155/2022/9901018>
9. Résière D, Florentin J, Mehdaoui H, Mahi Z, Gueye P, Hommel D, et al. Clinical Characteristics of Ciguatera Poisoning in Martinique, French West Indies: A Case Series. *Toxins* [Internet]. 2022. [cited 2025 Sep 18];14:535. doi: 10.3390/toxins14080535
 10. Gonzáles BS, Hernández BSC, Expósito Lara A, Fera Díaz GE. Intoxicación por ciguatoxina. *CCM* [Internet]. 2025 [cited 2025 Oct 31];29:e5297. Available from: <https://revcocmed.sld.cu/index.php/cocmed/article/view/5297>
 11. Raposo GS, Louzao MC, Fuwa H, Sasaki M, Vale C, Botana LM. Determination of the toxicity equivalency factors for ciguatoxins using human sodium channels. *Food Chem Toxicol*. [Internet]. 2022 [cited 2025 Oct 31];160:112812. doi: 10.1016/j.fct.2022.112812
 12. Pan American Health Organization. Foodborne diseases [Internet]. Washington DC: PAHO; 2023 [cited 2025 Sep 20]. Available from: <https://www.paho.org/es/temas/enfermedades-transmitidas-por-alimentos>
 13. World Health Organization. World food safety day. Communication toolkit. [Internet]. Geneva: WHO; 2024. [cited 2025 Sep 20]. Available from: https://cdn.who.int/media/docs/default-source/campaigns-and-initiatives/world-food-safety-day-2024/wfsd2024-communication-toolkit-es.pdf?sfvrsn=17969554_15&download=true
 14. Ferrari RG, Rosario DK, Cunha NA, Mano SB, Figueiredo ES, Conte JC. Worldwide Epidemiology of Salmonella Serovars in Animal-Baed Foods: a Meta-analysis. *Appl Environ Microbiol*. [Internet]. 2019 [cited 2025 Sep 27];85: e00591-19. doi: 10.1128/AEM.00591-19
 15. Khan AS, Georges K, Rahaman S, Abebe W, Adesiyun AA. Characterization of Salmonella Isolates Recovered from Stages of the Processing Lines at Four Broiler Processing Plants in Trinidad and Tobago. *Microorganisms* [Internet]. 2021 [cited 2025 Sep 27];9:1048. doi: 10.3390/microorganisms9051048
 16. Marchello CS, Birkhold M, Crump JA. Complications and mortality of non-typhoidal salmonella invasive disease: a global systematic review and meta-analysis. *Lancet Infect Dis*. [Internet]. 2022 [cited 2025 Sep 27];22(5):692-705. doi: 10.1016/S1473-3099(21)00615-0
 17. Zizza A, Fallucca A, Guido M, Restivo V, Roveta M, Trucchi C. Foodborne Infections and Salmonella: Current Primary Prevention Tools and Future Perspectives. *Vaccines (Basel)* [Internet]. 2024 [cited 2025 Sep 27];13(1):29. doi: 10.3390/vaccines13010029
 18. Chlebicz A, Śliżewska K. Campylobacteriosis, salmonellosis, yersiniosis, and listeriosis as zoonotic foodborne diseases: a review. *Int J Environ Res Public Health* [Internet]. 2018 [cited 2025 Sep 20];15(5):863. Available from: <https://www.mdpi.com/1660-4601/15/5/863>
 19. European Food Safety Authority; European Centre for Disease Prevention and Control. The European Union One Health 2023 Zoonoses Report [Internet]. Parma: EFSA; 2024 [cited 2025 Sep 20]. Available from: <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2024.9106>
 20. Pan American Health Organization. PANAFTOSA states that foodborne diseases can be avoided with preventive actions along the farm to the table continuum [Internet]. Río de Janeiro: PAHO; 2022 [cited 2025 Sep 20]. Available from: <https://www.paho.org/es/noticias/7-6-2022-panaftosa-advierte-que-enfermedades-transmitidas-por-alimentos-pueden-ser>
 21. Parra JP, Castro LU, León FI, Pérez MC, Bone EC. Evaluación de la Hepatitis A como enfermedad transmitida por alimentos en Ecuador durante el 2015. *Cumbres* [Internet]. 2017 [cited 2025 Oct 31];3(1):25-32. Available from: <file:///C:/Users/lenovo/Downloads/Dialnet-EvaluacionDeLaHepatitisAComoEnfermedadTransmitidaP-6550741.pdf>
 22. Instituto Nacional de Salud. Informe de evento Brotes de Enfermedades Transmitidas por Alimentos 2024. [Internet]. Bogotá: INS; 2024. [cited 2025 Sep 26]. Available from: <https://www.ins.gov.co/buscador-eventos/Informesdeevento/ETA%20INFORME%20DE%20EVENTO%202024.pdf>
 23. Ochoa A, Escandón S, Ochoa C, Heredia O, Ortiz J. Incidencia de las enfermedades transmitidas por alimentos en Ecuador. *Rev Peru Med Exp Salud Publica* [Internet]. 2024 [cited 2025 Sep 26];41(3):273-80. doi: 10.17843/rpmesp.2024.413.13456
 24. World Health Organization (WHO). Five keys to safer food manual. Geneva: World Health Organization [Internet]. Ginebra: WHO; 2007 [cited 2025 Sep 24]. Available from: <https://www.who.int/publications/i/item/9789241594639>
 25. World Health Organization. Food safety [Internet]. Geneva: WHO; 2024 [cited 2025 Oct 31]. Available from: https://www.who.int/es/health-topics/food-safety#tab=tab_1
 26. Codex Alimentarius. Código de Prácticas de Higiene para los Alimentos. CXC 1-1969 [Internet]. Roma: FAO/OMS; 2020 [cited 2025 Sep 24]. Available from: https://www.fao.org/fao-who-codexalimentarius/sh-proxy/es/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252Fstandards%252FCXC%2B1-1969%252FCXC_001s.pdf
 27. Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet* [Internet]. 2022 [cited 2025 Sep 27];629:655. doi: 10.1016/S0140-6736(21)02724-0
 28. Severino N, Gómez R, Morales P. Bacterial foodborne diseases in Central America and the Caribbean. *Pathogens* [Internet]. 2025. [cited 2025 Sep 26];16(4):78. <https://doi.org/10.3390/pathogens16040078>
 29. Apruzzese I, Song E, Bonah E, Sanidad VS, Leekitcharoenphon P, Medardus JJ, et al. Investing in food safety for developing countries: opportunities and challenges in applying whole-genome sequencing for food safety management. *Foodborne pathog Dis*. [Internet]. 2019 [cited 2025 Sep 26];16(7):463-473. doi: doi.org/10.1089/fpd.2018.2599
 30. Rojas A, Berena Y, Martínez A. Análisis epidemiológico de las enfermedades transmitidas por alimentos-ETA durante la pandemia de Covid-19 en un departamento del Caribe colombiano, 2021-2022. *Salud Uninorte* [Internet]. 2025 [cited 2025 Sep 27];41(3):727-743. doi: 10.14482/sun.41.03.036.015

Authorship contribution

EMA: Data curation, results analysis, discussion, and writing – original draft.

YAR: Investigation, project administration, material resources, and software.

LGA: Conceptualization, methodology, final review of the article, and supervision.

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Conflict of interest statement

The authors declare that they have no conflicts of interest.