

ORIGINAL ARTICLES

# SURVEILLANCE OF SALMONELLOSIS IN THE VARNA REGION FOR THE PERIOD 01.01–31.07.2024

Dilyana Stankova, Nataliya Ilieva, Nevyana Yankova

*Regional Health Inspectorate, Varna, Bulgaria*

## ABSTRACT

**INTRODUCTION:** Non-typhoidal salmonella (NTS) is a foodborne zoonotic pathogen with significant implications for human health. Non-typhoidal salmonella infections continue to be a major global issue, representing the second most important zoonosis in the European Union (EU) and beyond.

**AIM:** The aim of this article is to present the features of the epidemic process in NTS diseases in the Varna region and to evaluate the complex measures implemented to limit the spread of the infection and eliminate the epidemic focus.

**MATERIALS AND METHODS:** Official data from the Anti-Epidemic Control Department of the Regional Health Inspectorate (RHI) in Varna and data from the National Center for Infectious and Parasitic Diseases (NCIPD) were used. Microbiological and epidemiological analyses, among others, were conducted during the processing of the information.

**RESULTS:** From 01.01 to 31.07.2024, 169 cases were registered. For this period, these cases accounted for about 30% of NTS patients in the Republic of Bulgaria. Five outbreaks were located in kindergartens, involving 134 cases. The remaining 35 cases were sporadic.

**CONCLUSION:** Following the isolation of all individuals who tested positive and the prompt and appropriate implementation of revised measures, the epidemic outbreaks in Varna were effectively limited and eliminated.

**Keywords:** NTS, epidemic outbreak, epidemic focus

## INTRODUCTION

Non-typhoidal salmonella (NTS) infections are caused by gram-negative bacteria that belong to the family *Enterobacteriaceae*. These are acute infectious diseases characterized by a short incubation period and diverse clinical signs, most often alimentary gastroenteritis and general intoxication. The disease is transmitted through the ingestion of food products

of animal origin contaminated primarily or secondarily with the bacteria (1).

Although approximately 2,500 serotypes have been identified, the majority of NTS infections are caused by two salmonella serotypes: Typhimurium and Enteritidis (2).

Non-typhoidal salmonella diseases remain a significant global issue, representing the second most important zoonosis in the EU and beyond. They are also the second most commonly reported foodborne gastrointestinal infection in humans in the EU and a major cause of foodborne outbreaks in EU member states and countries outside the EU (3–6).

Salmonellosis surveillance in the Republic of Bulgaria is carried out based on laboratory tests according to Ordinance No. 21/18.07.2005 of the Ministry of Health (7). According to this regulation,

---

### Address for correspondence:

Dilyana Stankova  
Regional Health Inspectorate  
3 Bregalnitsa St  
9002 Varna, Bulgaria  
e-mail: dilyana.stankova1996@gmail.com

**Received:** November 8, 2024

**Accepted:** December 14, 2024



the diagnosis is based on clinical and epidemiological data and clinical, laboratory, and microbiological studies. Clinical criteria for the diagnosis of NTS (*Salmonella* spp., other than *S. typhi* and *S. paratyphi*) include any person with at least one of the following symptoms: diarrhea, fever, abdominal pain, or vomiting. Laboratory criteria include the isolation of salmonella (other than *S. typhi* and *S. paratyphi*) from a clinical sample or the detection of salmonella nucleic acid (other than *S. typhi* or *S. paratyphi*) in a clinical specimen. Epidemiological criteria include at least one of the following epidemic links: person-to-person transmission, exposure to a common source, animal-to-human transmission, consumption of contaminated food or drinking water, and environmental exposure.

### AIM

The aim of this article is to present the features of the epidemic process of NTS infections in the Varna region and to assess the complex measures implemented to limit the spread of the infection and eliminate the emerging epidemic outbreaks (foci). The study was conducted as a retrospective analysis of NTS cases in the Varna region during the period from 01.01 to 31.07.2024.

## MATERIALS AND METHODS

### Microbiological Analysis

Retrospective analysis of the results of microbiological examinations from clinical materials of patients and contact individuals, as well as environmental samples from the epidemiological focus, was conducted.

Retrospective analysis of data from the Microbiology and Virology Department at the Regional Health Inspectorate (RHI) in Varna was conducted in connection with the control of disinfection. Swabs were taken from the hands of staff and children attending childcare facilities, as well as samples from the environment in the epidemic focus.

### Epidemiological Studies

Retrospective analysis of epidemiological studies conducted by the Anti-Epidemic Control Department of the RHI. Investigations included ill children and staff in children's facilities (both hospitalized and treated on an outpatient basis), as well as contact persons. Evaluations were conducted to as-

sess adherence to hygienic standards, anti-epidemic protocols, and quarantine measures within kindergarten facilities.

### Publicly Available Platforms

Data obtained from publicly available NTS infection monitoring platforms in Bulgaria and other EU countries was used, where ethical approval or informed consent was deemed unnecessary.

### Documentary Method

Infection registration journals were reviewed.

## RESULTS

Between January 1 and July 31, 2024, a total of 510 NTS infection cases were reported nationwide. During this period, 169 cases were registered in the Varna region, 31 of which required hospitalization. Five outbreaks were reported in the Varna region, all occurring in kindergartens. These outbreaks accounted for 134 NTS infection cases, while the re-

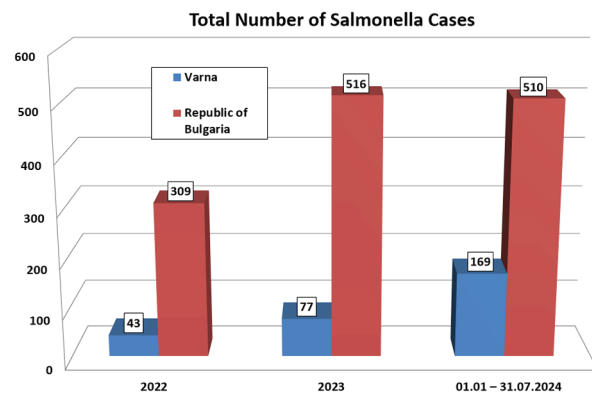


Fig. 1. Total Number of Salmonella Cases

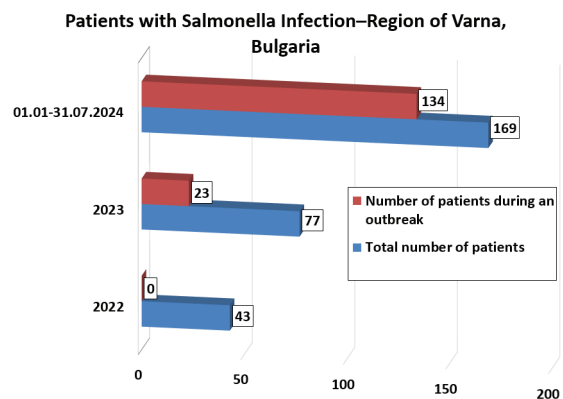


Fig. 2. Patients with Salmonella Infection—Region of Varna, Bulgaria

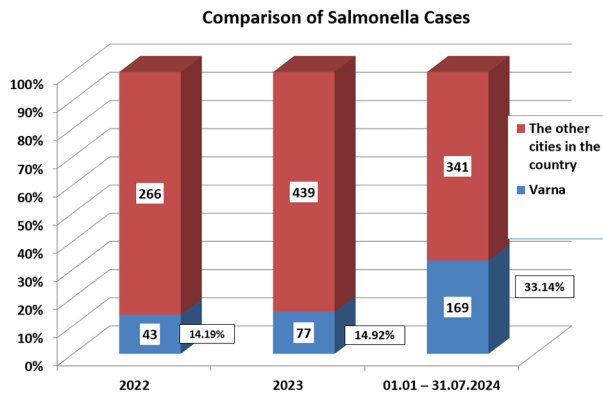


Fig. 3. Comparison of Salmonella Cases

maintaining 35 cases were sporadic. The most affected age groups were 1–4 years and 5–9 years.

The age distribution of the 134 cases registered during the outbreaks was as follows:

- ◆ 1–4 years: 63 children
- ◆ 5–9 years: 61 children
- ◆ Adults: 7 individuals

The relative share of NTS patients in the Varna region, compared to the total number of patients in Bulgaria during the study period, was approximately 33.14%.

## DISCUSSION

The observed trends highlight a significant and escalating issue related to NTS diseases in Bulgaria, particularly in the Varna region, and across the EU. These trends may be attributed to advancements in diagnostic methods, enhanced epidemiological investigations, and more comprehensive case reporting.

According to the Centers for Disease Control and Prevention (CDC), NTS infections typically present with acute diarrhea, abdominal cramps, and fever. The incubation period is usually 12–96 hours but can extend to seven days. The disease typically resolves without treatment after 1–7 days (8,9).

Non-typhoidal salmonella infections remain a neglected group of enteric pathogens whose prevalence is increasing at an alarming rate worldwide (10–12). The relative underestimation of diarrheal syndrome's importance, despite numerous studies, is concerning (13,14).

Microbiological analysis requires adherence to specific timelines for sample seeding and cultur-

ing. Test results are usually ready within 36–72 hours (15,16). Foodborne illness investigations involve strict conditions for food sample collection, as outlined in Bulgarian regulations (17,18).

However, despite the institutions' efforts to analyze food samples, these are no longer available at the establishments due to the expiration of the mandatory storage period outlined in Ordinance No. 4, dated June 21, 2000, issued by the Minister of Health. The circumstances described above often limit the identification of the primary source of infection and the associated transmission factors.

In addition to the usual anti-epidemic measures, the control of the disinfection regimen in kindergartens was strengthened. Environmental swabs, as well as samples from the hands of staff and children, were collected for analysis. The identified gaps were corrected. Syndromic surveillance has been used for early detection of outbreaks, in collaboration with the Regional Food Safety Agency in Varna. In each case of a child with complaints from the gastrointestinal system, food samples from the respective children's institution were also examined as soon as possible in order not to miss a 48-hour period of availability of the samples.

The short incubation period, extensive prevalence of infectious carriers, and procedural delays in microbiological diagnostics hinder prompt implementation of anti-epidemic measures. Often, more than five days elapse between the onset of symptoms and etiological diagnosis, delaying the testing of contact persons. This limits the identification of primary infection sources and associated transmission factors.

## CONCLUSION

The epidemic process progressed in an inkspot manner, with an epidemic tail unusual for foodborne outbreaks. This suggests alimentary transmission followed by contact-household spread, resulting in an atypical progression. Delayed diagnosis and untimely sampling, within the first 48 hours, prevented the identification of primary sources and transmission factors.

Enhanced disinfection protocols in kindergartens and early detection of outbreaks through syndromic surveillance proved effective but labor-intensive. Prompt isolation and the implementation of re-

vised measures successfully limited and eliminated the outbreaks.

## REFERENCES

- Lamichhane B, Mawad AMM, Saleh M, Kelley WG, Harrington PJ 2nd, Lovestad CW, et al. Salmonellosis: An Overview of Epidemiology, Pathogenesis, and Innovative Approaches to Mitigate the Antimicrobial Resistant Infections. *Antibiotics (Basel)*. 2024 Jan 13;13(1):76. doi: 10.3390/antibiotics13010076.
- World Health Organization. Salmonella (non-typhoidal) [Internet]. World Health Organization. World Health Organization: WHO; 2018. Available from: [https://www.who.int/news-room/fact-sheets/detail/salmonella-\(non-typhoidal\)](https://www.who.int/news-room/fact-sheets/detail/salmonella-(non-typhoidal))
- WHO. Multi-country outbreak of Salmonella Typhimurium linked to chocolate products – Europe and the United States of America [Internet]. [www.who.int](http://www.who.int). 2022. Available from: <https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON369>
- Three clusters of Salmonella Enteritidis ST11 infections linked to chicken meat and chicken meat products. EFSA Supporting Publications [Internet]. 2023 Nov;20(11). Available from: [https://www.ecdc.europa.eu/sites/default/files/documents/ROA\\_S-Enteritidis-ST11\\_chicken-meat\\_2023\\_amended.pdf](https://www.ecdc.europa.eu/sites/default/files/documents/ROA_S-Enteritidis-ST11_chicken-meat_2023_amended.pdf)
- Benson HE, Reeve L, Findlater L, Vusirikala A, Pitzsch M, Olufon O, et al. Local Salmonella Enteritidis restaurant outbreak investigation in England provides further evidence for eggs as source in widespread international cluster, March to April 2023. *Euro Surveill*. 2023 Jul;28(27):2300309. doi: 10.2807/1560-7917.ES.2023.28.27.2300309.
- Multi-country outbreak of Salmonella Mbandaka ST413, possibly linked to consumption of chicken meat in the EU/EEA, Israel and the UK. EFSA Supporting Publications. 2022 Dec;19(12). doi: 10.2903/sp.efsa.2022.EN-7707
- Ordinance No. 21/18.07.2005 of the Minister of Health on the regulation for registration, communication and reporting of communicable diseases.
- Plumb I, Fields P, Bruce B. Salmonellosis, Non-typhoidal | CDC Yellow Book 2024 [Internet]. [wwwnc.cdc.gov](http://wwwnc.cdc.gov). 2023. Available from: <https://wwwnc.cdc.gov/travel/yellowbook/2024/infections-diseases/salmonellosis-nontyphoidal>
- Eikmeier D, Medus C, Smith K. Incubation period for outbreak-associated, non-typhoidal salmonellosis cases, Minnesota, 2000-2015. *Epidemiol Infect*. 2018 Mar;146(4):423-9. doi: 10.1017/S0950268818000079.
- Kumar S, Kumar Y, Kumar G, Kumar G, Tahlan AK. Non-typhoidal Salmonella infections across India: emergence of a neglected group of enteric pathogens. *J Taibah Univ Med Sci*. 2022 Mar 7;17(5):747-754. doi: 10.1016/j.jtumed.2022.02.011.
- Nhung NT, Phu DH, Carrique-Mas JJ, Padungtod P. A review and meta-analysis of non-typhoidal Salmonella in Vietnam: Challenges to the control and antimicrobial resistance traits of a neglected zoonotic pathogen. *One Health*. 2024 Mar 2;18:100698. doi: 10.1016/j.onehlt.2024.100698.
- Tabo DA, Granier SA, Diguimbaye CD, Marault M, Brisabois A, Mama B, et al. Are Salmonella-Induced Gastroenteritis Neglected in Developing Countries? Feedback from Microbiological Investigations in N'Djamena Hospitals, Chad. *PLoS One*. 2015 Aug 27;10(8):e0136153. doi: 10.1371/journal.pone.0136153.
- Viegelmann GC, Dorji J, Guo X, Lim HY. Approach to diarrhoeal disorders in children. *Singapore Med J*. 2021 Dec;62(12):623-629. doi: 10.11622/smedj.2021234.
- Manetu WM, M'masi S, Recha CW. Diarrhea Disease among Children under 5 Years of Age: A Global Systematic Review. *Open Journal of Epidemiology*. 2021;11(03):207-21. doi:10.4236/ojepi.2021.113018
- Pusterla N, Byrne BA, Hodzic E, Mapes S, Jang SS, Magdesian KG. Use of quantitative real-time PCR for the detection of Salmonella spp. in fecal samples from horses at a veterinary teaching hospital. *Vet J*. 2010;186(2):252-5. doi: 10.1016/j.tvjl.2009.08.022.
- Giannella RA. Salmonella [Internet]. NIH. University of Texas Medical Branch at Galveston; 1996. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK8435/>
- Regulation of the Ministry of Agriculture and Food Industry No. 2 of March 27, 2024 on the conditions and procedure for sampling and laboratory testing of foods, Bulgaria
- Ordinance No. 4/21.06.2000 of the Minister of Health on the communication, investigation and registration of an outbreak of food-borne disease