NATIONAL PUBLIC
HEALTH ORGANIZATION

EPIDEMIOLOGICAL DATA OF

ENTEROHAEMORRHAGIC *E*. COLI INFECTION (EHEC), GREECE, 2004-2023

MANDATORY NOTIFICATION SYSTEM

Main points

- Enterohaemorrhagic *E*. coli infection (EHEC) is a mandatory notifiable disease with low notification rate in Greece.
- During the 2004-2023 period 70 cases were reported.
- In 2020, a waterborne gastroenteritis outbreak of mixed aetiology was notified and investigated. STEC and *E. coli* O157 were detected among other pathogens in clinical samples.
- During the period 2021-2023, an increase in the number of reported cases was noticed, probably due to the revision of case definition.
- The interpretation of the low notification rate of the disease should consider the surveillance systems' probable under-reporting, the differences of the laboratory capacity for the diagnosis of the disease and the different dietary habits of the populations among countries.

Escherichia coli is a Gram-negative, rod-shaped bacterium that belongs to the Enterobacteriaceae family. The terms "Enterohaemorrhagic *E*. coli (EHEC)", "*Shiga*-toxin-producing *E*. coli (STEC)" and "*Vero*-toxin-producing *E*. coli (VTEC)" have all been used to describe a group of strains which have the ability to produce toxins similar to the one produced by *Shigella dysenteriae* (*Shiga*-toxin). An important characteristic of this serogroup is its inability to ferment sorbitol. There have been identified about 200 different serotypes of EHEC, out of which more than 100 have been implicated with the occurrence of disease in humans. Apart from the O157:H7 serovar, which is considered the most clinically important,

other serovars, such as O26, O103, O91, O145, O146 and O128 can produce toxins and cause similar clinical conditions [1].

Similarly, the serotype that has been implicated for the majority of outbreaks worldwide is the O157:H7 [2]. However, there have been outbreaks caused by different serotypes, like the O104:H4 serotype that was the causative agent of a large outbreak in Germany and the other European countries in May 2011 [3-5]. The EHEC infection can cause severe bloody diarrhoea and abdominal cramps. Sometimes, diarrhoea can be non-haemorrhagic or the infection can be subclinical. In some cases, especially in children below five years old and in the elderly, becoming infected can lead to Haemolytic Uraemic Syndrome (HUS), a complication characterized by red cells destruction and probable renal failure [1]. The disease was introduced in the mandatory notification system in Greece in 2004. In 2018, the European EHEC's case definition changed and the laboratory criteria were updated by the European Commission [6].

Time trend

The mean annual notification rate of EHEC infection for the period 2004-2023 was 0.3 cases per 1,000,000 population. In total, 70 cases were reported, 38 (54.3%) of which females. The median age of the cases was 28.7 years (minimum: 0 - maximum: 84). The distribution of the reported cases per year for the period 2004-2023 is presented in **Table 1**.

In 2020, a waterborne gastroenteritis outbreak of mixed aetiology was notified and investigated in Peloponnese Region. STEC and *E. coli* O157 were detected among other pathogens in clinical samples. In the case-control study conducted, consumption of tap water (OR = 10.9, 95% CI = 3.1-38.0, p <0.001) and ice cubes (OR = 39.3, 95% CI = 10.3-150.9, p <0.001) were independently associated with the onset of gastroenteritis [7].

During the period 2021-2023, an increase in the number of notified cases was noticed. Epidemiological investigation did not reveal a link among the cases. This increase can probably be due to the introduction of the revised case definition, in 2021 in Greece.

In addition, in 2023, the laboratory capacity of diagnosis of EHEC infection in the Health Care Facilities of the Region of Thessaly was enhanced, in the context of prompt response in terms of public health protection, after the floods in the affected area. This fact may also explain the increase in the reported incidence of the disease in 2023.

Conclusion

According to the latest data published by the European Centre for Disease Prevention and Control (ECDC) the mean annual notification rate in EU/EEA (European Union/European Economic Area without UK) countries, in 2022, was 24.7 cases per 1,000,000 population [8]. When interpreting the difference from the notification rate in Greece (2.1 cases per 1,000,000 population in 2023), it should be considered that the surveillance systems' probable under-reporting, the laboratory capacity for the diagnosis of the disease and the dietary habits of the populations may vary among countries [9].

References

[1] Heymann DL. Control of Communicable Diseases Manual. 21st Edition, 2022. Washington DC: American Public Health Association.

[2] Luna S, Krishnasamy V, Saw L, et al. Outbreak of *E. coli* O157:H7 Infections Associated with Exposure to Animal Manure in a Rural Community - Arizona and Utah, June-July 2017. MMWR Morb Mortal Wkly Rep 2018;67:659–662. Available from: http://dx.doi.org/10.15585/mmwr.mm6723a2.

[3] Kampmeier S, Berger M, Mellmann A, Karch H, Berger P. The 2011 German Enterohemorrhagic Escherichia Coli O104:H4 Outbreak-The Danger Is Still Out There. Curr Top Microbiol Immunol. 2018;416:117-148. Available from: https://doi.org/10.1007/82_2018_107 .

[4] Wadl M, Rieck T, Nachtnebel M, on behalf of the HUS surveillance and laboratory team. Enhanced surveillance during a large outbreak of bloody diarrhoea and haemolytic uraemic syndrome caused by Shiga toxin/verotoxin-producing *Escherichia* coli in Germany, May to June 2011. Euro Surveill 2011, 16(24):pii=19893. Available from: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19893

[5] Köckerling E, Karrasch L, Schweitzer A, Razum O, Krause G. Public Health Research Resulting from One of the World's Largest Outbreaks Caused by Entero-Hemorrhagic Escherichia coli in Germany 2011: A Review. Front Public Health. 2017 11;5:332. Available from: https://doi.org/10.3389/fpubh.2017.00332

[6] European Centre for Disease Prevention and Control: Case definitions for EU surveillance. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0945

[7] Mellou K, Sideroglou T, Kefaloudi C, et al. (2021). Waterborne outbreak in a rural area in Greece during the COVID-19 pandemic: contribution of community pharmacies. Rural and remote health, 21(3), 6630. https://doi.org/10.22605/RRH6630

[8] European Centre for Disease Prevention and Control. Surveillance Atlas of Infectious Diseases. STEC/VTEC infection. Data by Country and Year. Current time period: 2022 Available from: https://atlas.ecdc.europa.eu/public/index.aspx

[9] EFSA and ECDC (European Food Safety Authority and European Centre for Disease Prevention and Control), 2023. European Union One Health 2023 Zoonoses Report. EFSA Journal 21(12). https://doi.org/10.2903/j.efsa.2023.8442

Table 1. Annual distribution of notified cases of Enterohaemorrhagic *E*. coli (EHEC) infection in Greece, Mandatory Notification System, 2004-2023.

Year	Number of reported cases
2004	2
2005	0
2006	1
2007	1
2008	0
2009	0
2010	1
2011	1
2012	0
2013	2
2014	1
2015	1
2016	2
2017	3
2018	1
2019	5
2020	3
2021*	10
2022	14
2023	22
Total	**70**

*A revised case definition was used in 2021

Last update: April 2024