

SURVEILLANCE REPORT

Typhoid and paratyphoid fever

Annual Epidemiological Report for 2020

Key facts

- Typhoid and paratyphoid fevers are relatively rare in the European Union/European Economic Area (EU/EEA) and are mainly acquired during travel to countries outside the EU/EEA, particularly in South Asia.
- For 2020, 17 EU/EEA countries reported a total of 315 cases.
- The EU/EEA notification rate declined by 64% in 2020 compared to the period 2016–2019 and was at the lowest ever level since the start of reporting in 2007. The decline was most likely due to the travel restrictions implemented during the COVID-19 pandemic, but also a result of the absence of UK data after their withdrawal from the EU, since the UK accounted for the second highest notification rates in the past.
- The usual seasonal pattern, with peaks in spring and late summer, was not observed in 2020. Instead, the highest case counts were reported in January, before declining, with only two smaller peaks in July and November.
- Of the 169 cases with information on travel status, 73.4% were travel-related, with India and Pakistan being the most common destinations.
- Although three vaccines against typhoid fever are available, it was still more frequently reported than paratyphoid fever, for which a vaccine is not yet available.

Introduction

Typhoid and paratyphoid fevers are severe systemic diseases caused by the bacteria *Salmonella* Typhi and *Salmonella* Paratyphi. Humans are the reservoir for these bacteria. Transmission occurs via food or water contaminated with faeces from an infected person, or via direct person-to-person contact. After an incubation period of 1–2 weeks, a disease develops which is characterised by sustained fever, headache, malaise, cough, rash, and an enlarged spleen. Diarrhoea may be present at some stage, but there may also be constipation in adults. When *Salmonella* Typhi is the cause of infection, intestinal perforation and haemorrhage may occur. Bloodstream infections are common, and various organs can be affected by the infection. The case-fatality ratio in untreated typhoid fever is about 10%, while the effects of paratyphoid fever are usually less severe. Antibiotic therapy has radically changed the prognosis of typhoid fever, though antimicrobial resistance is an increasing problem. Preventive measures include good personal and food hygiene. Effective vaccines are available for typhoid fever, but not for paratyphoid fever.

Methods

This report is based on data for 2020 retrieved from The European Surveillance System (TESSy) on 5 November 2021. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

For a detailed description of methods used to produce this report, please refer to the 'Methods' chapter [1].

An overview of the national surveillance systems is available online [2].

Suggested citation: European Centre for Disease Prevention and Control. Typhoid and paratyphoid infection. In: ECDC. Annual epidemiological report for 2020. Stockholm: ECDC; 2024.

Stockholm, July 2024

© European Centre for Disease Prevention and Control, 2024. Reproduction is authorised, provided the source is acknowledged.

A subset of the data used for this report is available through ECDC's online 'Surveillance atlas of infectious diseases' [3].

It is mandatory to report typhoid and paratyphoid fever in all EU/EEA countries. The surveillance systems have national coverage in all but three Member States (France, the Netherlands and Spain). The population coverage is estimated to be 48% in France and 64% in the Netherlands. The variation in coverage was taken into consideration when calculating the national notification rates. No information on estimated coverage was provided by Spain, preventing the calculation of notification rates. One Member State (Bulgaria) in 2020 reported aggregate data for salmonellosis from which typhoid and paratyphoid cases cannot be distinguished. No data for 2020 was reported by the United Kingdom, due to its withdrawal from the EU on 30 January 2020.

For 2020, eleven EU/EEA countries reported antimicrobial resistance data for *Salmonella* Typhi and/or Paratyphi. Nine countries reported phenotypic resistance data as disk zones or minimum inhibitory concentration (MIC) values. Two countries reported resistance predicted from whole genome sequencing (WGS).

In addition to TESSy reporting, information from event-based surveillance for typhoid and paratyphoid clusters or outbreaks with a potential EU dimension was collected through the Epidemic Intelligence Information System for Food- and Waterborne Diseases (EPIS-FWD).

Epidemiology

For 2020, 28 EU/EEA countries reported case-based data on typhoid and paratyphoid fevers. Among these, 19 countries reported 315 confirmed cases. Nine countries did not report any cases and no data was reported by the United Kingdom due to its withdrawal from the EU on 30 January 2020. The EU/EEA notification rate was 0.11 cases per 100 000 population which was a decrease of 64% compared to the average in 2016–2019 (Table 1). The highest notification rates were reported in France and Belgium with 0.34 and 0.30 cases per 100 000 population, respectively (Table 1, Figure 1).

Of the 169 cases with information on travel status, 124 (73.4%) were related to travel. The probable country of infection was available for 96 (77.4%) of these cases, all of which were associated with travel to countries outside the EU/EEA. India and Pakistan were the two main travel destinations, accounting for 34.4% and 30.2% of travel-associated cases with available information. Among the domestically-acquired cases, France reported the highest number (25 cases), the majority of which were linked to the French territory Mayotte in the Indian Ocean, where typhoid fever is endemic (personal communication N. Jourdan da Silva, Sante Publique, France, 12 Feb 2024).

Of 216 cases with known information on specimen type, 70.0% of the cases had the bacteria isolated from their blood.

Table 1. Confirmed typhoid and paratyphoid fever cases and rates per 100 000 population by country and year, EU/EEA, 2016–2020

Country	2016		2017		2018		2019		2020	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Austria	17	0.20	15	0.17	13	0.15	15	0.17	2	0.02
Belgium	42	0.37	49	0.43	53	0.46	70	0.61	34	0.30
Bulgaria	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC
Croatia	0	0.00	1	0.02	4	0.10	2	0.05	0	0.00
Cyprus	0	0.00	0	0.00	1	0.12	0	0.00	0	0.00
Czechia	0	0.00	0	0.00	0	0.00	6	0.06	1	0.01
Denmark	24	0.42	23	0.40	24	0.42	22	0.38	13	0.22
Estonia	0	0.00	2	0.15	2	0.15	0	0.00	0	0.00
Finland	5	0.09	15	0.27	14	0.25	6	0.11	6	0.11
France	222	0.69	198	0.62	208	0.65	279	0.87	110	0.34
Germany	95	0.12	120	0.15	87	0.11	120	0.14	36	0.04
Greece	9	0.08	8	0.07	7	0.07	9	0.08	3	0.03
Hungary	3	0.03	1	0.01	0	0.00	2	0.02	1	0.01
Iceland	2	0.60	0	0.00	0	0.00	0	0.00	0	0.00
Ireland	17	0.36	22	0.46	15	0.31	27	0.55	3	0.06
Italy	123	0.20	148	0.24	120	0.20	136	0.23	43	0.07
Latvia	0	0.00	0	0.00	1	0.05	6	0.31	4	0.21
Liechtenstein	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC	NDR	NRC
Lithuania	3	0.10	1	0.04	3	0.11	3	0.11	0	0.00

Country	2016		2017		2018		2019		2020	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Luxembourg	1	0.17	1	0.17	1	0.17	4	0.65	0	0.00
Malta	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Netherlands	56	0.33	62	0.36	66	0.38	67	0.39	10	0.06
Norway	25	0.48	20	0.38	31	0.59	33	0.62	12	0.22
Poland	0	0.00	8	0.02	8	0.02	5	0.01	0	0.00
Portugal	9	0.09	9	0.09	16	0.16	10	0.10	12	0.12
Romania	1	0.01	0	0.00	1	0.01	1	0.01	1	0.01
Slovakia	1	0.02	2	0.04	0	0.00	0	0.00	1	0.02
Slovenia	3	0.15	0	0.00	2	0.10	1	0.05	0	0.00
Spain	31	NRC	30	NRC	35	NRC	40	NRC	7	NRC
Sweden	16	0.16	37	0.37	32	0.32	42	0.41	16	0.15
United Kingdom	456	0.70	204	0.31	374	0.56	533	0.80	NA	NA
EU-EEA	1 161	0.30	976	0.25	1 118	0.28	1 439	0.37	315	0.11

Source: country reports.

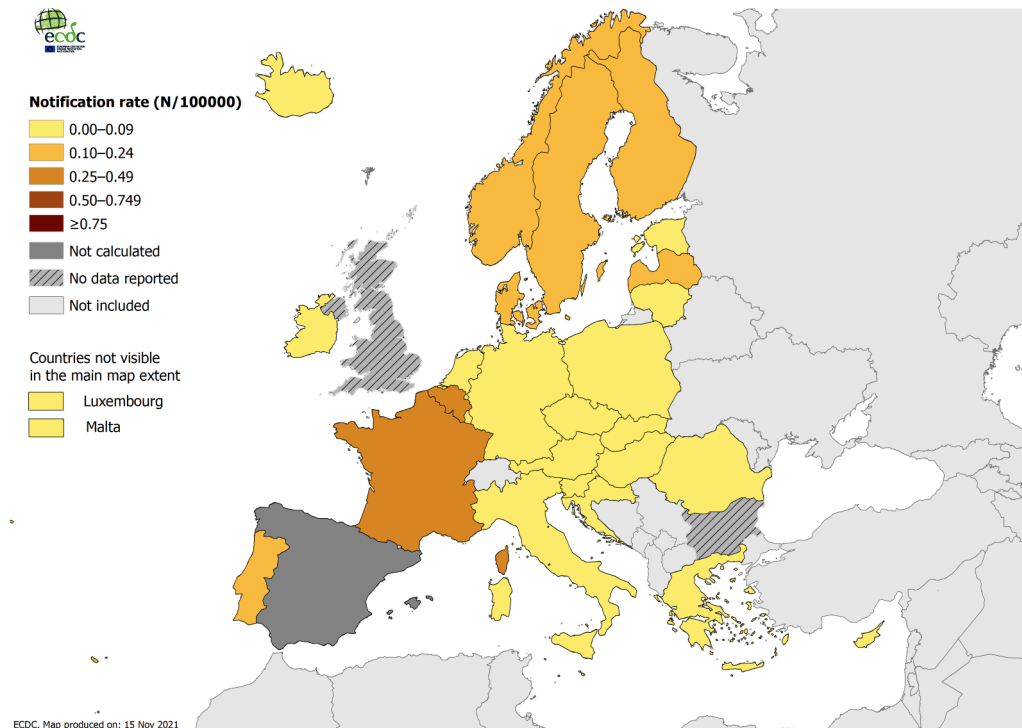
NDR: no data reported.

NRC: no rate calculated.

NA: not applicable.

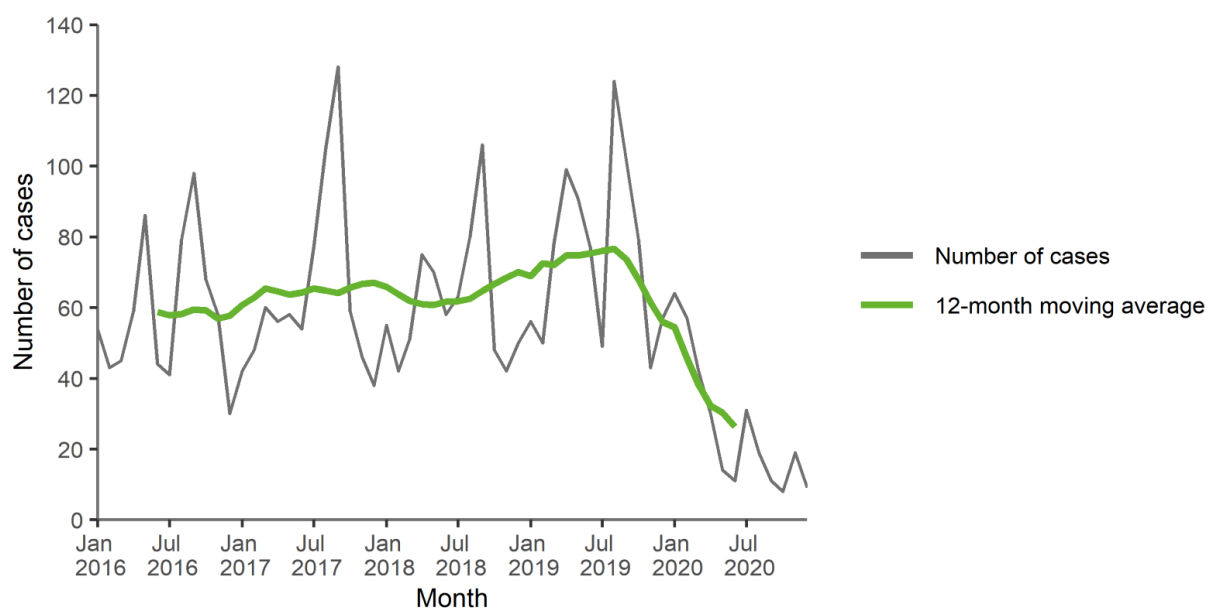
No data were reported by the United Kingdom for 2020 due to its withdrawal from the EU on 31 January 2020.

Figure 1. Confirmed typhoid and paratyphoid fever cases per 100 000 population by country, EU/EEA, 2020

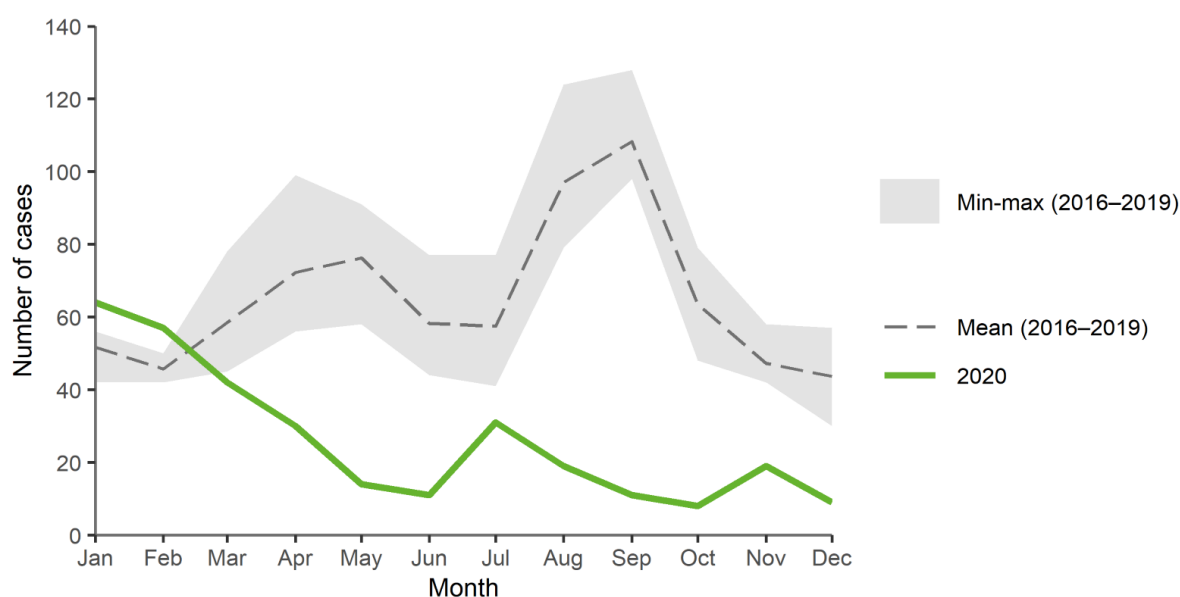


Source: country reports from Austria, Belgium, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, and the United Kingdom. No rate calculated for Spain.

In 2020, there was a substantial drop in typhoid and paratyphoid fever cases reported in the EU/EEA compared to previous years (Figure 2 and Figure 3). The usual seasonal pattern, with a pronounced peak in late summer-early autumn and a small peak in late spring was not observed in 2020 (Figure 3). Instead, cases declined from January onwards and only two smaller peaks were observed, in July and November, which were still below the average for any month in the previous four years.

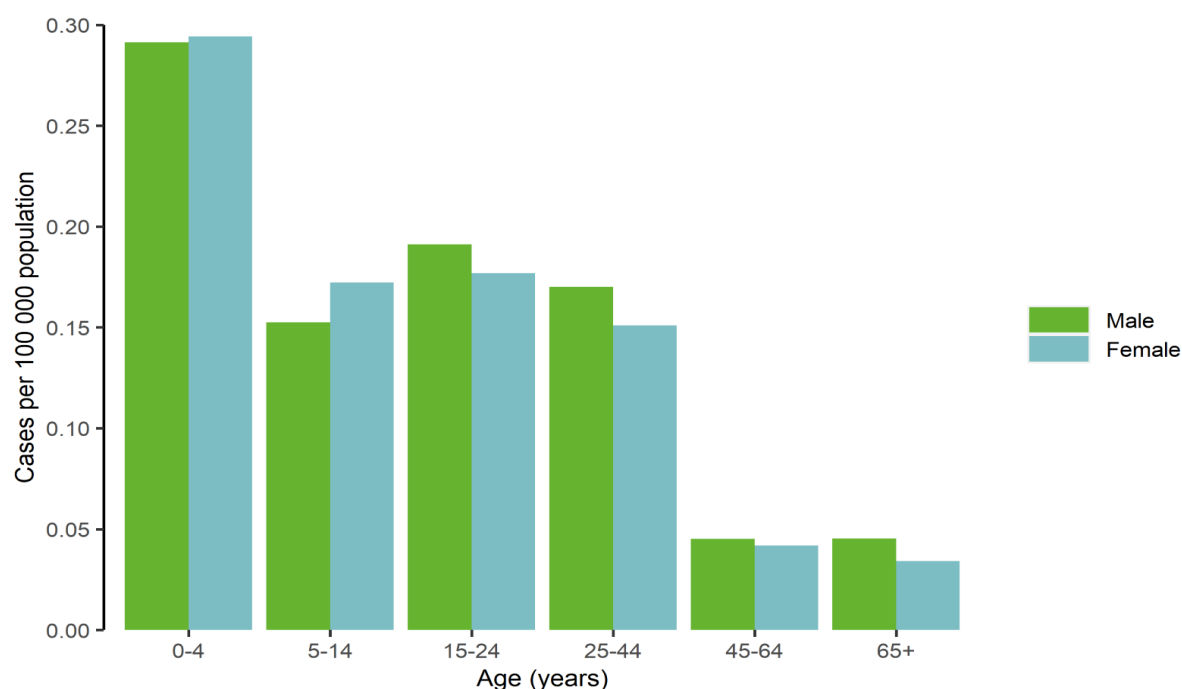
Figure 2. Confirmed typhoid and paratyphoid fever cases by month, EU/EEA, 2016–2020

Source: Country reports from Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

Figure 3. Confirmed typhoid and paratyphoid fever cases by month, EU/EEA, 2020 and 2016–2019

Source: Country reports from Austria, Belgium, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

In 2020, the notification rate was highest in children aged 0–4 years (0.29 cases per 100 000 population), followed by children aged 5–14 years. These were then followed by the age groups 15–24 years, and adults aged 25–44 years, both of which had similar rates (0.16–0.18 cases per 100 000 population). As in other years, the lowest rates were among cases aged 45–64 and >65 years (Figure 3). The overall male-to-female ratio was 1.1:1.

Figure 4. Confirmed typhoid and paratyphoid fever cases per 100 000 population, by age and gender, EU/EEA, 2020

Source: Country reports from Austria, Belgium, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden.

Microbial surveillance

Serotype

Typhoid fever accounted for 69.1% of typhoid/paratyphoid cases (Table 2). Among paratyphoid fever cases with known serotype, *S. Paratyphi A* was more dominant than *S. Paratyphi B* and *S. Paratyphi C*.

Table 2. *Salmonella enterica* serotype Typhi and *Salmonella* Paratyphi cases, EU/EEA, 2020

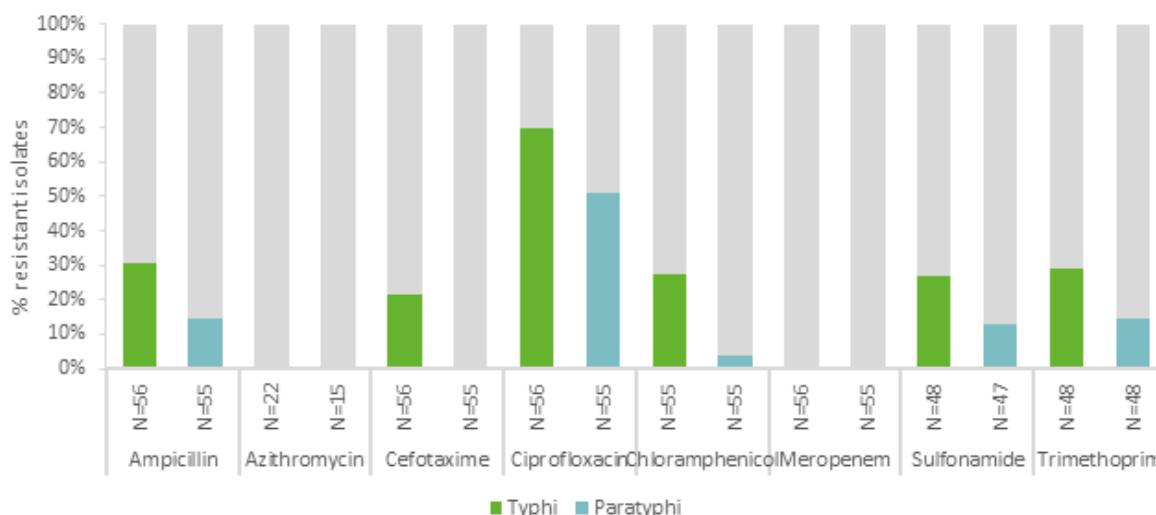
Serotype	Number of cases	Percentage
Typhi	219	69.1
Paratyphi A	50	15.8
Paratyphi B	23	7.3
Paratyphi C	3	1.0
Paratyphi (unspecified)	22	6.9
Total	317	100.0

Source: TESSy data, extracted 6 July 2023.

Antimicrobial resistance

Resistance to clinically important antimicrobials was observed in both *S. Typhi* and *S. Paratyphi* in 2020, with resistance generally higher in *S. Typhi*. Resistance to ciprofloxacin was most common, with 69.6% and 50.9% of isolates resistant in *S. Typhi* and *S. Paratyphi*, respectively (Figure 5). Resistance to ampicillin, sulfamethoxazole, trimethoprim and chloramphenicol was observed in about 30% of *S. Typhi* isolates, but in 15% or less of *S. Paratyphi*. Resistance to cefotaxime was only observed in *S. Typhi*, where 21.4% of isolates were resistant. Of the *S. Typhi* confirmed to be ESBL-producing (with resistance to third- and fourth-generation cephalosporins), all carried the beta-lactam gene *bla_{CTX-M-15}*. No resistance was observed to azithromycin or meropenem.

Six isolates from five EU/EEA countries displayed the same resistance pattern as the extremely drug-resistant (XDR) *S. Typhi* in the outbreak which has been ongoing in Pakistan since 2016 [4] (resistance to ampicillin, chloramphenicol, fluoroquinolones, third- and fourth-generation cephalosporins, and trimethoprim-sulfamethoxazole). Of these, two cases had a travel history to Pakistan, while the travel destination was unknown for the other cases. All isolates were from blood samples and three of the six cases were in children under five years.

Figure 5. Antimicrobial resistance in isolates from typhoid/paratyphoid infections by serotype, EU/EEA, 2020

Source: Country reports from Austria, Belgium, Denmark, Ireland, Italy, Malta, the Netherlands, Norway, Portugal, Spain and Sweden.

Outbreaks and other threats

No typhoid or paratyphoid fever events were reported by any EU/EEA country through ECDC's Epidemic Intelligence Information System for Food- and Waterborne Diseases (EPIS-FWD) in 2020. Although the outbreak of XDR *S. Typhi* that started in the Sindh province of Pakistan in November 2016 was still ongoing in 2020, fewer cases were reported (3 633) than during the peak in 2019 (9 731) [4]. At least five EU/EEA countries reported travel-associated cases with XDR *S. Typhi* in 2020, according to the antimicrobial resistance (AMR) data reported to ECDC (see above).

Discussion

It is estimated that between 11 and 21 million cases of typhoid and paratyphoid fever occur globally each year, with around 130 000 to 160 000 associated deaths [5]. The majority of cases are infected in South/South-East Asia, and sub-Saharan Africa. Estimates in 2017 showed the highest incidence in India and Bangladesh, with about 500–700 cases per 100 000 population [6].

In the EU/EEA, typhoid and paratyphoid fevers are relatively rare infections and most cases are associated with travel during the incubation period. This can usually be observed in the seasonal pattern of cases, with peaks occurring in September and late spring, most probably reflecting travel during holiday periods, with disease onset after returning home. However, in 2020, the usual increase from March onwards was not observed and instead, case counts declined rapidly. This was most likely due to the COVID-19 pandemic where lockdowns and travel restrictions changed people's travel habits. In 2020, tourist arrivals globally decreased by 72% compared to 2019, and in South Asia and South-East Asia, tourist arrivals decreased by 89–99% and 77–98% respectively during the period April to December [7]. India and Pakistan were the two main travel destinations for the EU/EEA cases, together accounting for about 65% of travel-associated cases for which information was available.

Typhoid and paratyphoid infections can cause very severe disease. The type of sample from which the bacteria is isolated can serve as an indication of the severity and in 2020, 70% of the cases had a bloodstream infection. Antimicrobial treatment is then necessary to avoid worsening symptoms, including fatality. Ciprofloxacin resistance was very common in both *S. Typhi* and *S. Paratyphi* and resistance to other antimicrobials used in treatment, including third- and fourth-generation cephalosporins, was about 30% in *S. Typhi*. Six of the 56 *S. Typhi* cases for which AMR data was provided carried a strain with the XDR pattern observed in the *S. Typhi* outbreak in Pakistan and half of these were children <5 years of age. As there are very few antimicrobials left for treating this strain, and only one of them (azithromycin) can be administered orally [8], vaccination against typhoid fever should be considered for travellers to Pakistan, particularly if staying for longer periods, or in areas with poor sanitation.

Public health implications

Typhoid and paratyphoid fevers are mainly travel-associated infections in the EU/EEA. Those planning to stay in high-endemicity countries for prolonged periods should consider vaccination in line with national recommendations before travel. Travellers should also be reminded of the need for proper food hygiene and handwashing practices during travel. Healthcare providers should be made aware of the possibility of XDR *S. Typhi* infection in patients returning from Pakistan.

References

1. European Centre for Disease Prevention and Control (ECDC). Introduction to the Annual epidemiological report. Stockholm: ECDC; 2017. Available from: <https://www.ecdc.europa.eu/en/annual-epidemiological-reports/methods>
2. European Centre for Disease Prevention and Control (ECDC). Surveillance systems overview [downloadable spreadsheet]. Stockholm: ECDC; 2022. Available from: <https://www.ecdc.europa.eu/en/publications-data/surveillance-systems-overview-2020>
3. European Centre for Disease Prevention and Control (ECDC). Surveillance atlas of infectious diseases. Stockholm: ECDC; 2021 [accessed 6 April 2024]. Available from: <http://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&HealthTopic=46>
4. Center for Disease Control, National Institute of Health Pakistan (NIH). Seasonal Awareness and Alert Letter (SAAL) for Epidemic-prone infectious diseases in Pakistan. Issue 55, October 2022–February 2023. Available from: <https://phb.nih.org.pk/wp-content/uploads/2023/01/SAAL-55-Issue-updated-final.pdf>
5. World Health Organization (WHO). Typhoid vaccines: WHO position paper. Geneva: WHO; March 2018. Available at: <https://www.who.int/publications/i/item/whio-wer9313>
6. Stanaway JD, Reiner RC, Blacker BF, Goldberg EM, Khalil IA, Troeger CE, et al. The global burden of typhoid and paratyphoid fevers: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet Infect Dis* 2019 Apr;19(4):369–81. Available at: <https://www.sciencedirect.com/science/article/pii/S1473309918306856?via%3Dihub>
7. United Nation's World Tourism Organisation (UNWTO) Tourism Recovery Tracker dashboard [accessed on 5 April 2024]. Available from: [UNWTO Tourism Recovery Tracker | Tourism Dashboard](https://www.unwto.org/en/tourism-recovery-tracker)
8. Akram J, Khan AS, Khan HA, Gilani SA, Akram SJ, Ahmad FJ et al. Extensively Drug-Resistant (XDR) Typhoid: Evolution, Prevention, and Its Management. *Biomed Res Int*. 2020 May 2;2020:6432580. Available at: <https://www.hindawi.com/journals/bmri/2020/6432580/>