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## Note

## The impact of the COVID-19 pandemic on other infections differs by their route of transmission: A retrospective, observational study in Japan

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## ABSTRACT

**Introduction:** The Coronavirus disease 2019 (COVID-19) pandemic and people's subsequent behavioral changes have decreased the cases of respiratory infection worldwide. However, research on infectious diseases with other transmission modes is insufficient. The aim was to assess the impact of the COVID-19 pandemic on non-respiratory infectious diseases: infectious enterocolitis, sexually transmitted diseases such as human immunodeficiency virus (HIV) infection and syphilis, and tick-borne diseases.

**Methods:** This retrospective, cohort study used comprehensive surveillance data from the National Institute of Infectious Diseases in Japan from January 1, 2018, to December 31, 2021. The number of cases of infectious diseases before the COVID-19 pandemic (2018–2019) was compared with that during the COVID-19 pandemic (2020–2021). Reduction rates were calculated as the number of disease cases during the COVID-19 pandemic in 2020 and 2021, respectively, divided by the mean number of disease cases in 2018 and 2019.

**Results:** The total numbers of cases of infectious enterocolitis, sexually transmitted diseases, and tick-borne diseases during the study period were 2,507,304 cases, 24,972 cases, and 3012 cases, respectively. The number of cases decreased for infectious enterocolitis and sexually transmitted diseases during the COVID-19 pandemic compared with before the COVID-19 pandemic, with an approximately 40–50% decrease in enterocolitis and 30–55% decreases in sexually transmitted diseases. However, cases of tick-borne diseases changed little, with a 0.2% increase in 2020 and a 6% increase in 2021.

**Conclusion:** The COVID-19 pandemic had a different impact on the number of cases of infectious diseases depending on their mode of transmission.

The Coronavirus disease 2019 (COVID-19) pandemic has affected people's daily lives worldwide. Many preventive measures have been established, including social distancing, self-isolation, telework, school closures, improved personal hygiene, and travel restrictions. There is no doubt that these behavioral changes have decreased respiratory infections globally, because droplets are the major mode of transmission of such diseases and COVID-19. In fact, pneumonia [1], influenza [2], and respiratory syncytial virus infections [3] have decreased significantly during the COVID-19 pandemic. As in other countries, cases of respiratory infection have decreased in Japan [4]. Although the trend of decrease in respiratory infections has been discussed elsewhere, little research has been reported on infections with other transmission routes, such as contact-transmitted, sexually transmitted, and vector-borne diseases [5]. Therefore, the aim of this study was to assess the impact of the COVID-19 pandemic on the number of cases of non-respiratory infectious diseases, including infectious enterocolitis, sexually

transmitted diseases such as human immunodeficiency virus (HIV) infection and syphilis, and tick-borne diseases, using national data in Japan.

This retrospective, cohort study used comprehensive surveillance data from the National Institute of Infectious Diseases in Japan (NIID) from January 1, 2018, to December 31, 2021. The NIID is a research institute attached to the Ministry of Health, Labour and Welfare for conducting (i) fundamental and applied research on infectious diseases and (ii) national testing for lot release and development of antibiotics and vaccines [6]. The NIID provides the data about the number of cases of major infectious diseases in Japan for each week of each year. Data collection was performed on the basis of the Act on the Prevention of Infectious Diseases and Medical Care for Patients with Infectious Diseases (the Infectious Diseases Control Law). Permission to use information made available on the NIID homepage was provided.

The numbers of cases of infectious diseases before the COVID-19

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**List of abbreviations**

COVID-19 Coronavirus disease 2019  
 HIV Human immunodeficiency virus  
 NIID National Institute of Infectious Diseases

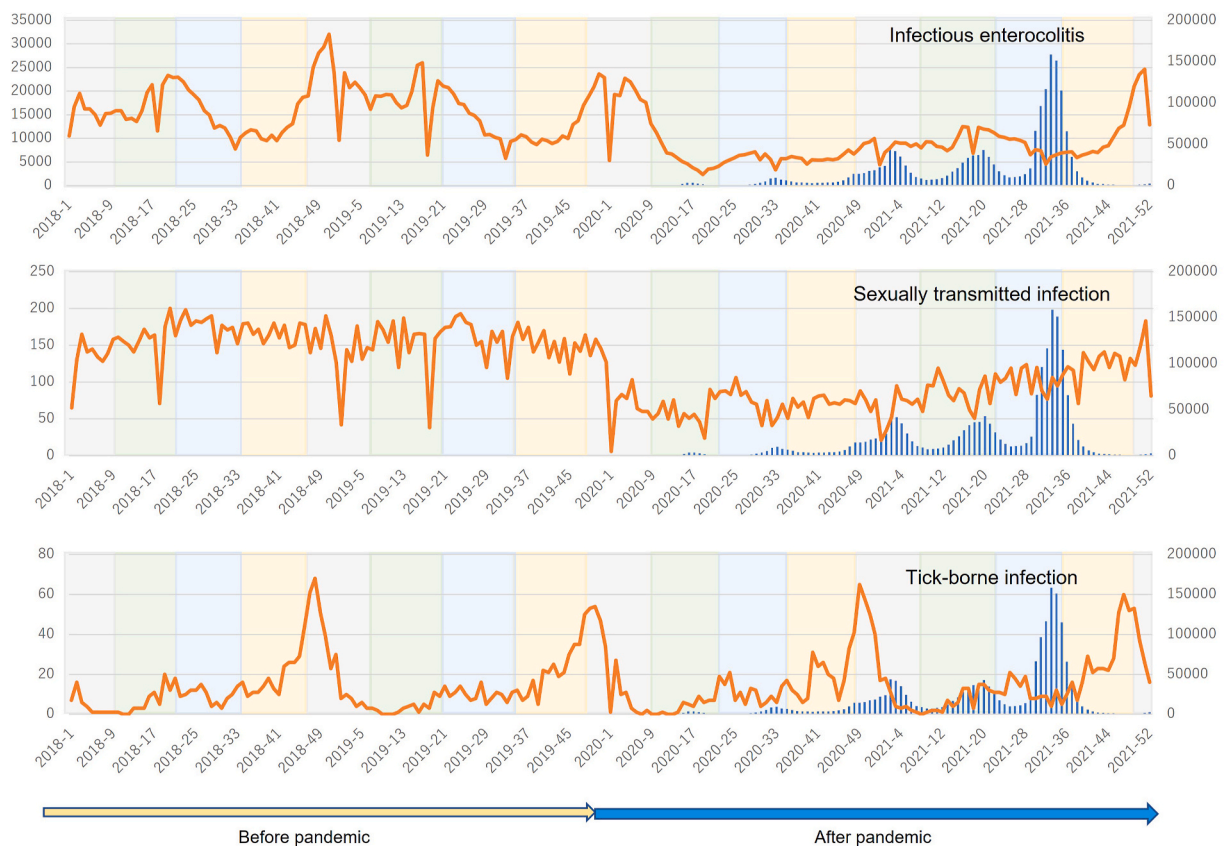
the number of cases of those infections on a monthly basis, rather than on a weekly one. Tick-borne diseases included scrub typhus and Japanese spotted fever, which have a large number of reported cases in Japan. Fever with thrombocytopenia syndrome and tick-borne encephalitis, which were also provided by the NIID database, were not included because of the small number of cases in Japan. Rates of reduction in disease incidence were calculated as the number of disease cases during the COVID-19 pandemic in 2020 and 2021, respectively,

**Table 1**  
 Number of cases of each infection during the study period.

	2018	2019	2020	2021	Reduction in cases in 2020	Reduction in cases in 2021
Infectious enteritis	850,138	809,065	419,973	509,459	49.4%	38.6%
Sexually transmitted disease	8308	7873	3549	5242	56.1%	35.2%
HIV infection	1301	1231	503	507	60.3%	60.0%
Syphilis	7007	6642	3046	4735	55.4%	30.6%
Tick-borne diseases	761	722	743	786	-0.2% <sup>a</sup>	-6% <sup>a</sup>
Scrub typhus	456	404	424	436	1.4%	-1.4% <sup>a</sup>
Japanese spotted fever	305	318	319	350	-2.4% <sup>a</sup>	-12.4% <sup>a</sup>

HIV: human immunodeficiency virus.

<sup>a</sup> Negative values indicate an increase in the number of cases.



**Fig. 1.** Trends in the number of cases of each infection. The bar graph shows the number of new cases of COVID-19, and the line graph shows the number of cases of each infection. The left vertical line shows the number of cases of each infection, and the right vertical line shows the number of cases of new cases of COVID-19. The horizontal line shows time with year and week. Upper: infectious enterocolitis, middle: HIV infection, lower: tick-borne diseases.

pandemic (2018–2019) were compared with those during the COVID-19 pandemic (2020–2021). The number of infectious cases was examined on a weekly basis to capture dynamic changes. Infectious diseases included infectious enterocolitis as a contact-transmitted disease, as well as HIV infection and syphilis as sexually transmitted diseases. Infections such as gonorrhea, genital herpes, condyloma, and chlamydia were not included as sexually transmitted diseases because the NIID only provides

divided by the mean number of disease cases in 2018 and 2019.

The total numbers of cases of infectious enterocolitis, sexually transmitted diseases, and tick-borne diseases during the study period were 2,507,304 cases, 24,972 cases, and 3012 cases, respectively (Table 1). The numbers of cases of infectious enterocolitis and sexually transmitted diseases decreased during the COVID-19 pandemic compared with before the COVID-19 pandemic, with an approximately

40–50% decrease in enterocolitis and 30–55% decreases in sexually transmitted diseases. However, cases of tick-borne diseases changed little, with a 0.2% increase in 2020 and a 6% increase in 2021.

Fig. 1 shows the trend in the number of cases of each infectious disease and the number of new cases of COVID-19. Infectious enterocolitis is endemic in Japan year-round, and it has two high endemic seasons, spring and winter. However, during the COVID-19 pandemic, the number of cases of infectious enterocolitis in 2020 dropped in the spring and increased slightly in the winter from 2020 to 2021. The number of cases of sexually transmitted diseases decreased once the COVID-19 pandemic occurred, becoming lower than before the COVID-19 pandemic. However, it increased gradually toward the end of 2021. For tick-borne diseases, the number of cases during the COVID-19 pandemic hovered at levels comparable to those before the COVID-19 pandemic: December was the month with the highest number of cases, and March was the lowest.

The current study showed the impact of the COVID-19 pandemic on rates of non-respiratory infectious diseases, including infectious enterocolitis, sexually transmitted diseases such as HIV infection and syphilis, and tick-borne diseases. Cases of infectious enterocolitis and sexually transmitted diseases such as HIV infection and syphilis decreased during the COVID-19 pandemic, whereas tick-borne diseases showed little change.

There are a number of reasons that may explain the observed decrease in cases of infectious enterocolitis. Considering that the survey target population of enterocolitis is children in Japan, infection prevention measures, especially school closures and daycare facility closures, would be the main reason for the decrease. The declaration of a state of emergency was effective from April 4, 2020, to May 25, 2020. In the same period, almost all of the schools in Japan were closed [7], which could have decreased the incidence of infectious diseases transmitted through both contact transmission and air-borne transmission [8]. In addition, because infectious enterocolitis spreads mainly through contact transmission, restrictions and interventions targeting SARS-CoV-2 transmission, including self-quarantine, remote work, large gathering restrictions, and personal hygiene measures such as mask-wearing and hand sanitization, could have substantially reduced the incidence of infectious enteritis as well.

As previously mentioned, the number of cases of sexually transmitted diseases such as HIV infection and syphilis also decreased during the COVID-19 pandemic; however, they increased gradually at the end of 2021. This decrease in sexually transmitted diseases might have been the effect of the stay-at-home order, which would have contributed to partners meeting more infrequently and a subsequent reduction in sexual contact [9]. Alternatively, the number reported may also have decreased due to individuals choosing to refrain from visiting clinics for screening [10]; a previous study showed a decrease in the number of HIV tests by healthcare centers during the COVID-19 pandemic [11]. Another report showed that syphilis in Tokyo increased gradually in 2021 [12], which was consistent with the present result. Different trends have been reported for sexually transmitted diseases, depending on the disease [13]. Further investigation should be performed to determine whether the rates of sexually transmitted diseases have remained at their decreased levels after the pandemic.

The number of cases of tick-borne diseases was little affected during the COVID-19 pandemic. This result was consistent with a previous study in China that showed little effect on the incidence of scrub typhus during the COVID-19 pandemic [5]. One explanation is that we may simply be observing year-to-year fluctuations. Indeed, the number of reports of tick-borne diseases in Japan varies considerably from year to year: before 2018, the numbers of cases of scrub typhus and Japanese spotted fever were 447 and 337 in 2017 and 505 and 227 in 2016, respectively. Alternatively, the geographic distribution of ticks might also be a potential explanation. Tick-borne diseases are rather local, indigenous infectious diseases [14]. Farmers, who usually live in rural areas where tick-borne diseases predominantly spread, would not have

been forced to stop work due to the pandemic. Otherwise, it may simply be because the number of tick-borne disease cases is so small that it is difficult to detect trends.

The current study has some limitations. The number of reported cases of infection may not represent the actual incidence. Patients refrained from seeking medical attention, leading to a decrease in screening tests, which could have affected the results. In Tokyo, for example, testing for diseases other than COVID-19 at some health centers has been suspended due to the COVID-19 pandemic [15].

In conclusion, the COVID-19 pandemic had differing impacts on the numbers of cases of infectious diseases depending on their mode of transmission. Infectious enterocolitis and sexually transmitted diseases such as HIV infection and syphilis decreased during the COVID-19 pandemic, whereas tick-borne diseases changed little.

#### Authorship statement

AK conceived of and designed this study, interpreted the data, drafted the manuscript, and revised the manuscript for important intellectual content. HM conceived of and designed this study, interpreted the data, and revised the manuscript for important intellectual content. TN conceived of and designed this study, and revised the manuscript for important intellectual content. All of the authors contributed to the acquisition of data, and reviewed, discussed, and approved the final manuscript.

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#### Declaration of competing interest

All authors declare that they have no competing interests.

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