

## BRIEF REPORT

# Noro- and rotavirus detections in children during COVID-19 pandemic—A nationwide register study in Finland

Social restrictions set due to the COVID-19 decreased childhood infections rapidly in 2020. Previous reports have shown that implementation of gathering restrictions and improved hygiene measures decreased the detection rates of norovirus and rotavirus.<sup>1,2</sup> As the restrictions have been relaxed, there has been concern that the norovirus and rotavirus cases would start to increase rapidly. The year 2021 was also predicted to have a high incidence of cases of norovirus and rotavirus as modelling studies suggested a possible two-fold increase in the detections compared with the pre-pandemic era.<sup>3,4</sup> Interestingly, a study from Hong Kong reported that despite continuous restrictions, the norovirus and rotavirus cases returned near to pre-pandemic levels.<sup>5</sup> As Finland minimised the restrictions set towards children already in the fall of 2020 and continued a similar strategy throughout the year 2021, we decided to analyse the primary care visit rate due to gastroenteritis in children aged 0–14 years. Furthermore, we analysed the norovirus and rotavirus detections in Finnish children aged 0–4 years during the COVID-19 pandemic.

We conducted a retrospective nationwide register-based surveillance study in Finland. We gathered the yearly numbers of visits due to gastroenteritis based on the ICD-10 diagnostic codes A08-A09 from the Care Register of Primary Healthcare. We included children aged 0–14 years for our visit analyses from 2018 to 2021. The register covers over 90% of the primary care facilities in Finland and is maintained by the Finnish Institute of Health Welfare. Furthermore, we gathered the monthly numbers of norovirus and rotavirus detections in the National Infectious Disease Register. All laboratories in Finland are mandated by the Law of Contagious Diseases to report all findings of notifiable diseases to the register. We included all detections from January 2018 to March 2022. We included only children aged 0–4 years in pathogen analysis, as the disease burden is highest in the youngest children.

We used the number of children in each age group at the end of the previous year as the nominator in the incidence analysis, and this information was gathered from the open-access register of Statistic Finland. We calculated monthly and yearly incidences per 100,000 children in each age group and compared the incidences by incidence rate ratio (IRR) with 95% confidence intervals (CI) to the pre-pandemic era (2018–2019). Our study is based on open-access data,

which are available free of charge from the website of the Finnish Institute of Health and Welfare, and therefore, we did not need any research permissions to conduct this study.

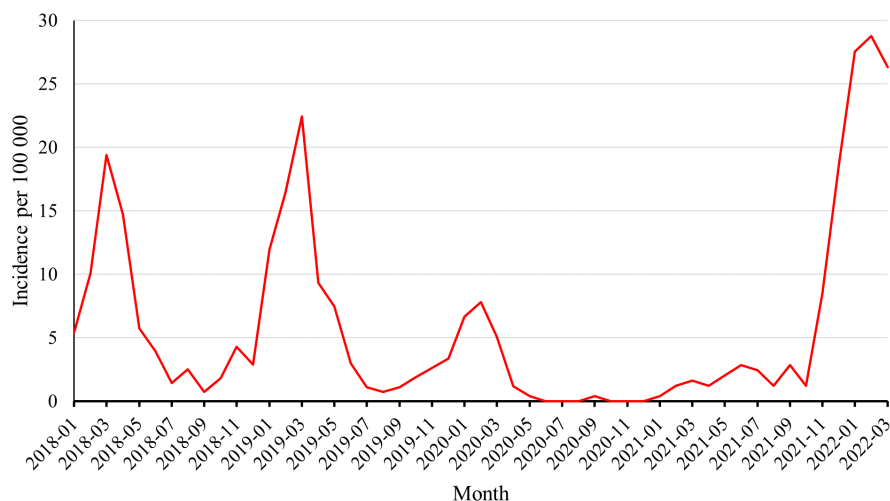
We included a total of 21 279 visits due to gastroenteritis and, of these, 3317 were in 2020 and 5497 in 2021. The yearly incidence of visits due to gastroenteritis in the pre-pandemic era (2018–2019) was 703 per 100 000 children. The incidence decreased by 46% in 2020 and was 381 per 100 000 (IRR 0.54 CI 0.52–0.56). The incidence was also 9% lower in 2021 (639 per 100 000) compared with the pre-pandemic era (IRR 0.91 CI 0.88–0.94). These findings are indicating a clear increase in the visit rate during the second year of the pandemic, compared to the first pandemic year, but remain slightly lower than in the pre-pandemic era.

We included a total of 786 norovirus detections and, of these, 55 were in 2020 and 109 in 2021 (Table S1). The incidence of norovirus detections was 70% lower in 2020 (IRR 0.30 CI 0.24–0.38) and 46% lower in 2021 (IRR 0.54 CI 0.45–0.65) compared to that in years 2018–2019. In the monthly analysis, norovirus incidence decreased practically to zero as the restrictions were set in March 2020. The incidence was low through the year 2021 until in March 2021 the incidence turned to the rapid increase and returned above the pre-pandemic levels during early 2022 (Figure 1).

We included a total of 327 rotavirus detections and, of these, 43 were in the year 2020 and 42 in the year 2021 (Table S1). The incidence of rotavirus detections was 64% lower in 2020 (IRR 0.28–0.47) and 72% lower in 2021 (IRR 0.28 CI 0.21–0.37) compared to that of the pre-pandemic incidence (2018–2019). Rotavirus cases have remained at low levels throughout the pandemic (Figure 1).

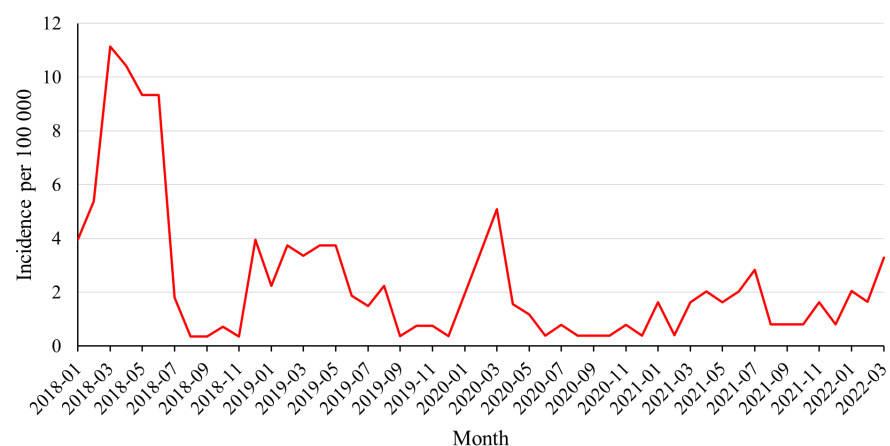
Our results show that the social restrictions reduced the visits due to gastroenteritis and both norovirus and rotavirus detections in Finnish children. Our results are in line with the previous reports from Germany, England and China,<sup>1–4</sup> which showed that the norovirus and rotavirus detections decreased rapidly after the restrictions were implemented. Interestingly, we report a much later increase in the incidence of norovirus than the previous report from Hong Kong,<sup>5</sup> although Finland relaxed the restrictions much earlier. The reason for this can only be speculated, but it could be due to the low population density in Finland. Furthermore, rotavirus cases did not return to the pre-pandemic level era during our study period, which

### Norovirus



**FIGURE 1** Monthly incidences of norovirus and rotavirus detections per 100 000 children aged 0–4 years in Finland from January 2018 to March 2022

### Rotavirus



differentiates from expected and from the reported return near to normal in Hong Kong.<sup>5</sup> On the contrary to our results, in Norway, rotavirus detections did not decrease significantly during the first year of the pandemic.<sup>6</sup> In the norovirus detections and acute gastroenteritis visit rates, the reductions were however similar during the first pandemic year as in our current report.<sup>6</sup>

Our main strength is the excellent coverage of the nationwide registers, which enables us to present precise nationwide incidence estimates. We have three main limitations. First, we did not have the visit rates or inpatient admissions due to gastroenteritis in secondary/tertiary care. Second, we did not have the number of faeces samples analysed as this information is not provided via nationwide registers. Third, the Care Register and Infectious Disease Register use different age stratification per default, and therefore, we did not present age-stratified visit rates. Fourth, the Care Register statistics are not yet available for 2022, and therefore, the visit rate due to acute gastroenteritis in early 2022 is not presented.

In conclusion, the social restrictions and improved hand hygiene measures reduced the circulation of gastroenteritis pathogens temporarily in children.

#### AUTHOR CONTRIBUTIONS

IK had the original idea. MA gathered the data. IK was in charge of the data analysis. IK wrote the initial draft. MA, MH and MR participated in the revisions. MR provided the resources and supervised the project.

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#### CONFLICT OF INTEREST

None to report.

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#### SUPPORTING INFORMATION

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