

**Decrease in paediatric emergency room visits during the COVID-19 pandemic
restrictions: a population-based study**

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Abstract

Aim: To investigate paediatric emergency room (ER) visits to evaluate the immediate health effects of COVID-19 pandemic restrictions on children.

Methods: We retrospectively examined paediatric ER visits in the Helsinki University Hospital (HUH) district during the first wave of the pandemic (1 March to 31 May 2020), and a 2-month period immediately before and after. These periods were compared to the corresponding time periods in 2015–2019 (“reference period”).

Results: The total number of ER visits decreased by 23.4% (mean 6474 during the reference period, to 4960 during the pandemic period (incidence rate ratio [IRR] 0.75, 95% confidence interval 0.72 to 0.77; $p < 0.001$). This was due to a decrease in visits related to infectious diseases; visits due to surgical reasons did not decrease. The amount or proportion of patients triaged to the most urgent class (Emergency Severity Index 1) did not increase. Paediatric ER visits returned to baseline after lifting of restrictions.

Conclusions: Although paediatric ER visits substantially decreased during the pandemic restrictions, children seen at the ER were not more severely ill. Our results do not indicate immediate detrimental health effects of pandemic control measures on children.

Key Notes

- Emergency visits related to infectious diseases declined remarkably during COVID-19 pandemic restrictions
- Children visiting the emergency room during pandemic restrictions were not more acutely or severely ill
- Stay at home recommendations from public health authorities in our setting did not appear to result in immediate harm to children attending the emergency room

Keywords

COVID-19, emergency department, paediatric, emergency care, health care

INTRODUCTION

The novel pandemic coronavirus SARS-CoV-2 is responsible for COVID-19 disease and generally causes a mild disease in children.¹⁻⁴ Nevertheless, paediatric health and healthcare has been affected by infection control measures. These effects may have been detrimental to child health,⁵⁻⁸ even to the extent that children may be considered collateral damage of the pandemic.⁹⁻¹¹ As children rarely become seriously ill with SARS-CoV-2, it is not acceptable for them to be excessively harmed by infection control measures.

A decrease of up to 70 – 80% in paediatric emergency visits during the SARS-CoV-2 pandemic has been reported,¹²⁻¹⁸ and children seeking emergency care have been more severely ill.^{5, 8-10} On the other hand, paediatric emergency room (ER) visits have been steadily increasing prior to the coronavirus pandemic,¹⁹ and there has been an international consensus that a significant proportion of paediatric ER visits are medically unnecessary or at least not urgent.²⁰

The decrease in ER visits during the coronavirus pandemic provides an opportunity to examine how large-scale information and restriction measures in society have affected the use of paediatric ERs. The situation can be examined particularly well in Finland, where health care capacity was not endangered, and the prevalence of SARS-CoV-2 was relatively low during the first wave of the pandemic.²¹ Under these circumstances, changes in healthcare seeking were more likely due to the societal measures than to the virus itself. Thus, we studied how ER visit patterns changed, and how this was reflected in the outcomes of ER visits.

METHODS

The Hospital District of Helsinki and Uusimaa (HUS) region in Southern Finland has 1 263 000 inhabitants, including 217 000 children (0–15-years) (2019). The region consists of both urban and suburban areas and cover 1216 km².

Finland (total population 5.5 M, paediatric population 0.9 M) is a Nordic welfare state with universal public health care. Tertiary-level emergency care, paediatric in-hospital care, and paediatric intensive care are provided exclusively in public hospitals. Helsinki University Hospital (HUH) has two paediatric emergency rooms (70 000 annual visits combined).

For this retrospective, single-centre study we retrieved all secondary and tertiary emergency room visits in the HUH region during the pandemic period 1 March to 31 May 2020 and corresponding time periods in 2015–2019. To exclude any potential new confounders, we also analysed the most recent prepandemic period (1 Jan to 28 Feb 2020 and corresponding time periods 2015–2019) and the immediate time periods after lifting the state of emergency in Finland (1 June to 31 July 2020 and the same period in 2015–2019). The state of emergency was lifted 15 June 2020.

The Emergency Severity Index (ESI) is a tool used in ER triage. The ESI stratifies patients into five groups, from level 1 (most urgent) to level 5 (least urgent). Higher acuity patients (ESI 1 and 2) are more likely to be admitted to the hospital. We used ESI triage classification and ICU admissions to estimate the illness severity at the time of presentation to the ER.

Statistical analysis

Data are described using counts and percentages and medians and inter-quartile ranges (IQR) for categorical and continuous variables, respectively. The overall differences between years 2015–2019 and 2020 were tested by comparing incidences rates between the years. The person-years for the incidences were obtained by scaling the yearly paediatric population sizes to the time periods. We further investigated the differences by comparing the weekly occurrences of all visits (Mann-Whitney *U* test) and proportions of the visit types (χ^2 tests) during the time periods between the pre-pandemic and pandemic years.

P-values < 0.05 were considered significant. Analyses were performed using R version 4.0.5. Plots were created using ggplot2-package.^{20,21}

RESULTS

The total number of ER visits decreased by 23.4% during the pandemic period when compared with the reference period mean in 2015–2019 (Figure 1, Table 1). The incidence of visits during the pandemic period decreased from 157.25 visits per 10 000 person years (PY) in 2015–2019 to 117.20 visits per 10 000 PY in 2020 (Table 1). The decrease in visits was sudden and remained at a lower-than-normal level until the end of May 2020 and at the end of May 2020. When the restrictions were significantly relaxed, the total number of visits quickly returned to or slightly exceeded pre-pandemic levels (Figure 1). The decrease in visits was not explained by a pre-existing trend (Figure 1).

ER visits during the pandemic period were less often urgent, as 0.5% (25 patients) were triaged to the most urgent class (ESI triage I) (Table 1). Compared with a mean of 70 (range 40–115) or 1.1% of all visits in the reference period, this translates to 1.68 ESI I triage class

patients per 10 000 PY in 2015–2019 to 0.59 ESI I triage patients per 10 000 PY in 2020 (Table 1, Table 2). After the first wave of the pandemic, the number of ESI-triage I and II patients increased marginally (Figure 2, Table 2).

The number of children transported by ambulance did not change during the pandemic period (Table 1, Table 2).

The hospitalization rate decreased from 21.6% during the reference period to 16.0 % during the pandemic period (Table 1). This translated to 33.92 patient admissions per 10 000 PY in 2015–2019 to 18.78 patient admissions per 10 000 PY in 2020 (Table 2). Paediatric intensive care unit (PICU) admission rates were similar during the pandemic and the reference periods (Table 1, Table 2).

Visits related to psychiatric conditions decreased slightly during the pandemic period (Table 2). However, the incidence of psychiatric visits increased significantly after lifting of restrictions (Table 2).

Visits due to infections decreased from a mean of 2288 (35.7% of all visits) during the reference period to 1122 (22.9%) during the pandemic period ($p < 0.001$) (Table 1). This was true for both respiratory and gastrointestinal infections (Table 2). The number of visits due to infections quickly returned to baseline after the pandemic period (Figure 2, Table 2).

DISCUSSION

This retrospective, single-centre, population-based study compared a 12-week period (1 March to 31 May 2020) during the first wave of the SARS-CoV-2 pandemic in Finland to the corresponding period in 2015–2019. Consistent with other studies^{1,12–18}, we observed that the number of paediatric emergency visits decreased by 23.4%. In contrast to other studies,^{9,12} we did not observe an increase in illness acuity or admission rate suggesting that despite the marked decrease in ER visits, the children seen in the ER were not more severely ill than in previous years. In fact, the proportion and the number of children triaged in the most urgent classes was even lower during the pandemic. However, another study in our area suggested a higher paediatric out-of-hospital mortality rate,¹¹ which suggests that not all aspects of adequate emergency care can be evaluated from an ER perspective.

In Finland, the state of emergency led to extensive infection control measures, including school closures and changes in healthcare. Families were instructed to stay at home and health authorities emphasized the risk of healthcare congestion. Interestingly, even though the incidence of SARS-CoV-2 was low during the first pandemic wave,²¹ and health care capacity was not endangered in Finland, the number of emergency room visits declined.

This finding is in accordance with other studies from other countries more severely affected by the virus.^{12–18,21}

The fear of possible SARS-CoV-2 transmission and health care overload may have increased the threshold to seek urgent care in families with children, as this has been reported in adults.^{9,24} Avoiding public transport, restrictions on the number of escorts in emergency departments and reduced availability of childcare may also have created practical barriers to healthcare access.

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Due to school closures, improved hand hygiene, and social distancing, children generally had fewer infectious diseases and invasive bacterial infections and thus did not need to visit the ER.²⁵ This decrease in visits due to infectious diseases also may have led to the reduced admission rate to the general ward, as infectious diseases are a common reason for paediatric hospital admissions. This may also have driven the decrease in the number of children presenting with the most urgent health problems, as these visits are also often due to infectious diseases (e.g., sepsis, febrile seizures, bronchiolitis, and respiratory failure).²⁶

In contrast to another study, visits due to surgical reasons did not decrease during the pandemic.²⁷ The increase in number of visits due to psychiatric reasons after lifting of restrictions suggests that the detrimental health effects of restrictions on children are more long term than immediate, a finding consistent with other studies.^{28,29}

Children frequently present to the ER with complaints that are of low acuity and do not require emergency care.^{19,20} Educational interventions among parents may substantially reduce low acuity ER visits.^{30,31} According to our results, it is difficult to determine whether this phenomenon reduced ER visits during the pandemic period, as the distribution in the acuity or the causes of the visits did not change. Nevertheless, our results suggest that immediate, serious health effects were not seen with a 25 % decrease in paediatric ER visits.

The strengths of this study include systematic data retrieval from a single electronic patient record system by a single researcher. The data are easily reproducible. In addition, the low SARS-CoV-2 prevalence in Finland²¹ accompanied with very strict restrictions allowed us to study the effects of the infection control measures separately from those of the virus itself. Accordingly, our results indicate that a substantial change in health-care-seeking behaviour

of a population can occur within a short time frame solely by following instructions from healthcare authorities, public measures affecting health-care availability and high media coverage.

This study is limited by its single-centre setting. However, the two ERs included in this study are responsible for 23% of paediatric hospital emergency visits in Finland. Second, our outcomes, such as ER visit triage categories or hospitalization rates, are not very sensitive markers of child health, even if they are robust. Thus, we cannot state that children and their health would not have been affected by the infection control measures; large-scale studies with more sensitive endpoints and longer follow-up are required to address these questions.

The long-term health effects of pandemic restrictions are unknown, and they may not have affected all children and all patient groups similarly. Nevertheless, our results suggest that in a setting with an established public health care system, a reduction in the number of ER visits due to public awareness and self-directed avoidance is possible without immediate detrimental health effects and likely also safe and feasible after the pandemic.

These results warrant further studies how to best inform families with children about indications for ER visits. These results also suggest that prevention of acute infections in small children is feasible with strict infection control measures; enhanced hand hygiene or staying at home when ill need not be limited to pandemic situations.

CONCLUSIONS

Paediatric ER visits decreased significantly during the first wave of the pandemic in Finland, where SARS-CoV-2 prevalence was low. Children who attended the ER were not more

severely ill or more often hospitalized Thus, in this setting, advising families to stay at home resulted in a 23.4% decrease in ER visits without causing immediate, detectable harm by delayed provision of healthcare.

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Conflict of interest: The authors have no conflict of interest to declare

Abbreviations:

ER emergency room, ESI emergency severity index, PICU paediatric intensive care unit, SARS-CoV-2 severe acute respiratory syndrome coronavirus 2

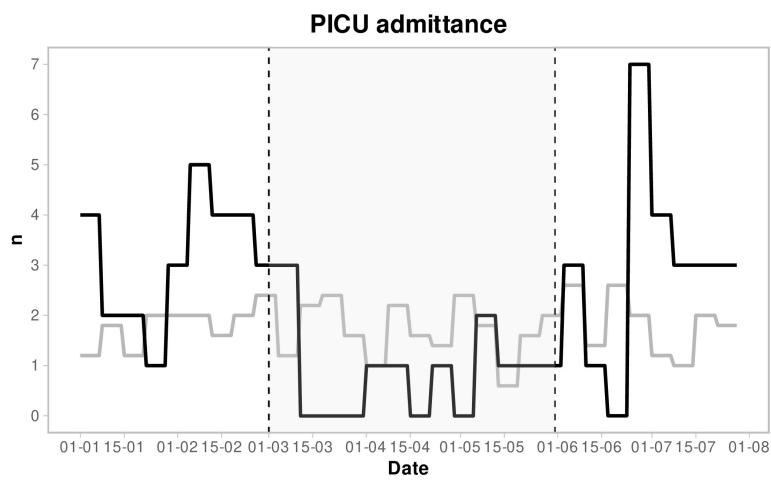
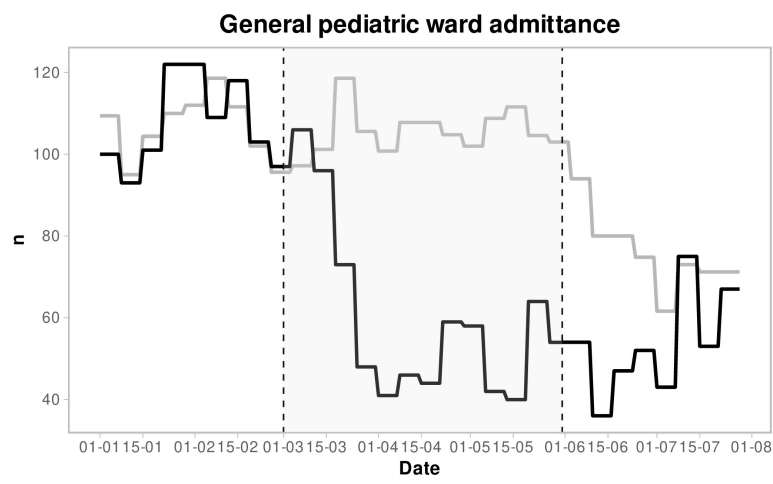
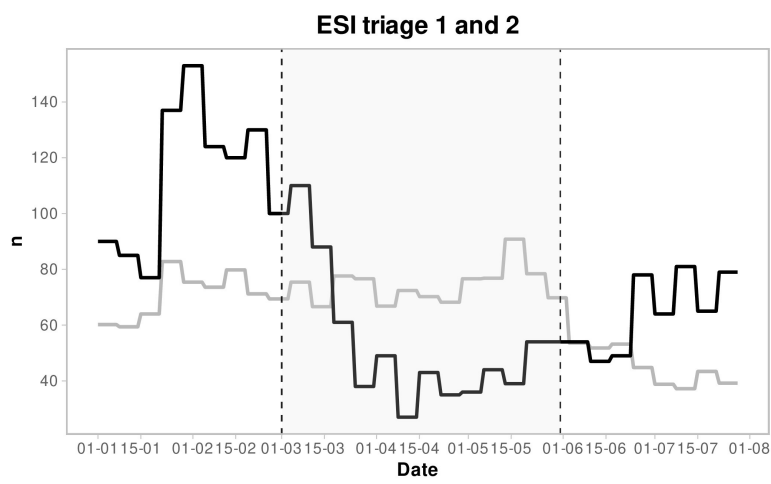
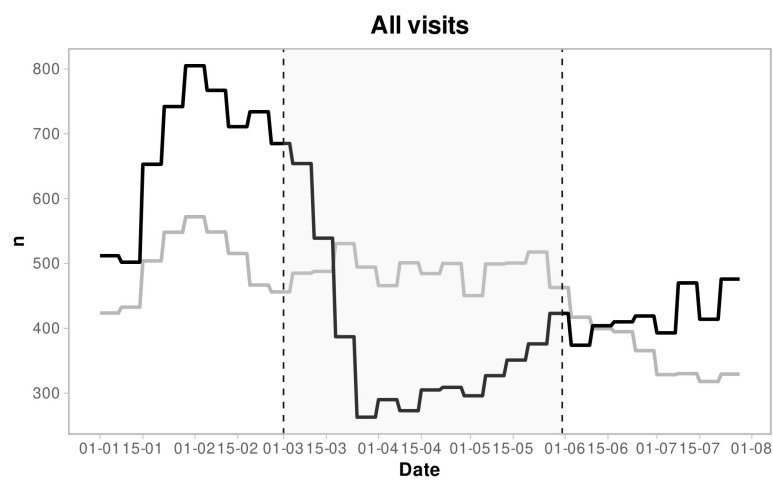
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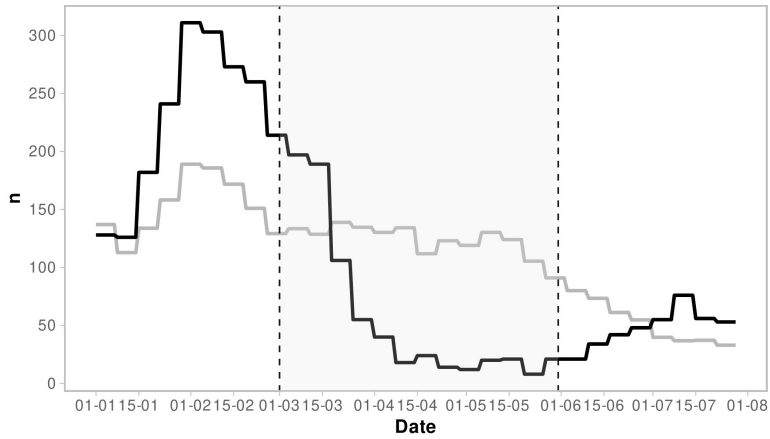
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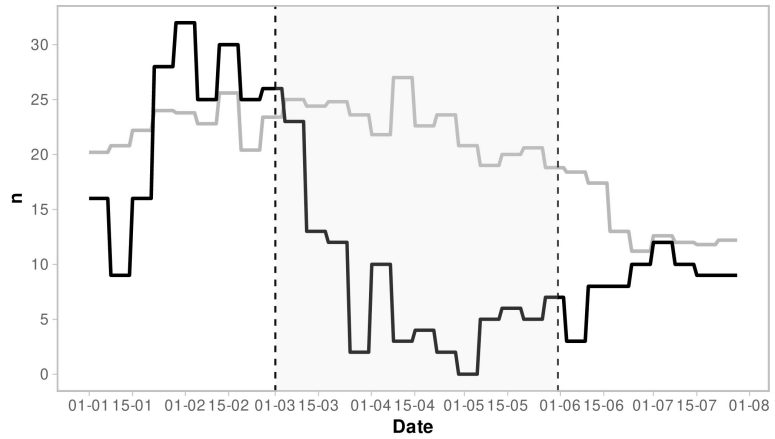
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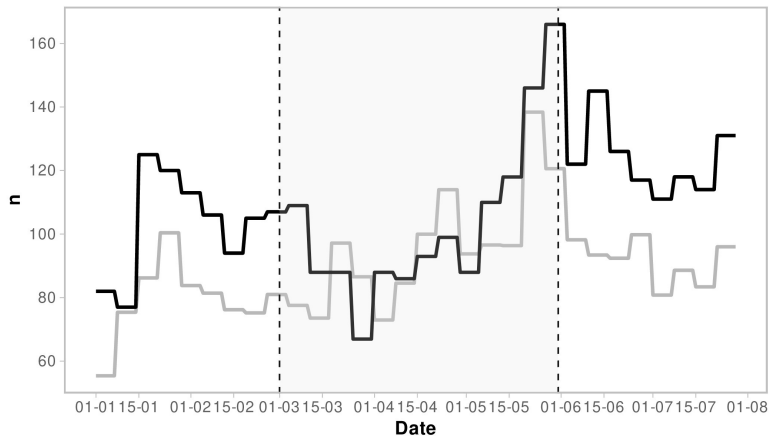
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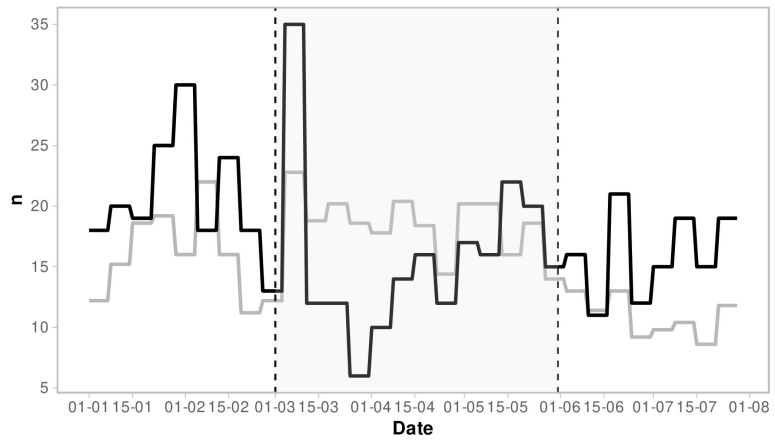
ICD-10 A08- and 09-diagnosis



ICD-10 T00 - T99 diagnosis



ICD-10 S00-S99 diagnosis



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