

COVID-19 in Children and the Dynamics of Infection in Families

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Since the onset of coronavirus disease (COVID-19) pandemic, children have been less affected than adults in terms of severity^{1–3} and frequency, accounting for <2% of the cases.^{2–5} Unlike with other viral respiratory infections, children do not seem to be a major vector of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission, with most pediatric cases described inside familial clusters⁶ and no documentation of child-to-child or child-to-adult transmission.^{7,8} The aim of this work was to describe the clinical presentation of the first 40 pediatric cases of COVID-19 in our city and the dynamics of their familial clusters.

METHODS

From March 10 to April 10, 2020, all patients <16 years old with SARS-CoV-2 infection were identified by means of the Geneva University Hospital's surveillance network (Switzerland). The network notifies the institution's pediatric infectious diseases specialists about results of nasopharyngeal specimens tested for SARS-CoV-2 by reverse-transcription polymerase chain reaction. This study was approved by the Regional Ethics Committee. After informed oral parental consent and its documentation in the medical charts, chart reviews were used to retrieve clinical data, and parents were called for patients and household contacts (HHCs) follow-up. HHCs were considered suspect if they had fever or acute respiratory symptoms, as per the

Swiss Federal Office for Public Health's case definition⁹ (Supplemental Information).

Categorical data were compared using the χ^2 test, with *P* values <.05 considered significant. Statistics were performed using SPSS version 23.0 (IBM SPSS Statistics, IBM Corporation).

RESULTS

Among a total of 4310 patients with SARS-CoV-2, 40 were <16 years old (0.9%). One patient for which telephone follow-up was not possible was excluded because of the inability to evaluate clinical evolution and HHC symptoms. The median follow-up of the households was 18 days (interquartile range [IQR]: 14–28).

Clinical Presentation, Diagnosis, and Management

Demographics, clinical presentation, and diagnosis of the study children are detailed in Table 1. Of note, 29 (74%) patients were previously healthy; the most frequently reported comorbidities were asthma (10%), diabetes (8%), obesity (5%), premature birth (5%), and hypertension (3%). Seven patients (18%) were hospitalized to the ward, for a median duration of 3 days (IQR: 2–4); reasons for admission were surveillance for nonhypoxemic viral pneumonia (*n* = 2), fever without source (*n* = 2), apparent life-threatening event (*n* = 1), and sepsis-like event (*n* = 1); 1 paucisymptomatic child admitted



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Drs Posfay-Barbe, Wagner, and L'Huillier conceived and designed the study, designed the data collection instruments, conducted the initial analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Drs Gauthey, Moussaoui, Loevy, and Diana critically reviewed the manuscript for important intellectual content and reviewed and revised the manuscript; and all the authors coordinated and supervised data collection and approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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In 79% of households, ≥ 1 adult family member was suspected or confirmed for COVID-19 before symptom onset in the study child, confirming that children are infected mainly inside familial clusters.⁶ Surprisingly, in 33% of households, symptomatic HHCs tested negative despite belonging to a familial cluster with confirmed SARS-CoV-2 cases, suggesting an underreporting of cases. In only 8% of households did a child develop symptoms before any other HHC, which is in line with previous data in which it is shown that children are index cases in $< 10\%$ of SARS-CoV-2 familial clusters¹⁰; however, with our study design, we cannot confirm that child-to-adult transmission occurred.

This study has some limitations. The study sample likely does not represent the total number of pediatric SARS-CoV-2 cases during this time period. Indeed, patients with milder or atypical presentation might not have sought medical attention. Moreover, the recall of symptom onset among HHCs might be inaccurate, although this seems for once less likely because of the confinement measures and anxiety in the community.

The results of this study are important because of the extensive

HHC tracing and the almost absence of loss to follow-up. Extended diagnostic screening of suspected cases and thorough contact tracing are needed to better understand the dynamics of transmission within households.

ABBREVIATIONS

COVID-19: coronavirus disease
HHC: household contact
IQR: interquartile range
SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

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