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ACTA PÆDIATRICA NURTURING THE CHILD WILEY

BRIEF REPORT

Clinical characteristics of paediatric COVID-19 patients followed for up to 13 months

1 | INTRODUCTION

Children are less affected by COVID-19 than adults.[1] But, a small proportion of children develop paediatric inflammatory multisystem syndrome,[2] with potentially lethal consequences. Studies have also described persistent long COVID symptoms that last more than 4 weeks from the onset of illness, including fatigue, muscle weakness, dyspnoea, chest pain, cough and anosmia.[2-5] However, information on paediatric long COVID remains scarce and studies often describe hospitalised populations.[2,3]

We report the first 201 paediatric patients under 16 years old that were tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in Marseille public hospitals during the first wave of the COVID-19 pandemic in France. We described the acute symptoms and long-term consequences of COVID-19 in the children, who were mostly outpatients.

Polymerase chain reaction assays were performed on nasopharyngeal swabs from 27 February to 15 May 2020, and the data were collected by Marseille university hospital.

Virus positive children were followed by the paediatric team *via* phone call 1, 2, 7, 14 and 30 days after the 1st positive sample and 10–13 months after the acute phase.

We assessed their age, sex, risk factors including chronic diseases and obesity, household exposure, symptoms and evolution, laboratory findings, chest X-rays, hospitalisation rates, paediatric intensive care unit admissions and mortality. The severity of the disease was assessed using the classification described by Dong et al.[1]

A descriptive analysis compared the main characteristics and a two-sided *p*-value of <0.05 indicated statistical significance.

The University Hospital Institute Mediterranean Infection ethics committee approved the study (number 2020-019), and it complied with the Declaration of Helsinki.

During the study period, 68 360 people were tested in Marseilles public hospitals and 3810 (5.6%) were under 16 year of age. The tests were positive in 9.3% of all cases and in 5.3% of the children. Most (92.0%) of the 201 children (sex ratio 0.97) were tested because they had close contact with other positive cases or respiratory symptoms. While 8.0% were screened during hospitalisation because they were suspected of having the virus or before a scheduled invasive intervention. Their median age was 9.3 years (range 17 days to 15 years). Of these children, 23.4% had comorbidities and 88.5% had household virus exposure.

We had data at diagnosis for 194/201 (96.5%) children and complete 30-day follow-up data for 158 (78.6%). Just over a quarter of 194 children (27.3%) were asymptomatic and diagnosed through close contact screenings, and 72.7% were symptomatic at diagnosis or after diagnosis if they were first diagnosed through close contact screening. Most children had mild symptoms, however two children, aged 4 and 8 years developed viral pneumoniae, which were categorised as moderate. A 1-year-old child had encephalitis, but spontaneously recovered in 1 month. All the paediatric patients clinically recovered and none died during the 30-day follow-up period. Younger patients were statistically significantly more likely to be hospitalised ($p = 0.012$). Laboratory findings were obtained for 14.9% of the 201 patients, which did not show any elevation in inflammatory markers. In addition, 6.5% had chest x-rays, which identified two viral pneumonia and seven bronchiolar syndromes.

The viral load threshold at diagnosis was known in 82.6% of the 201 children (mean 26.8 cycle thresholds, range 15.3, 34.7). There was no statistically significant difference between viral load and age group ($p = 0.894$) (Supplementary Material 1) and viral load and symptomatic cases ($p = 0.438$).

Follow-up data were available for 68.2% of the children (sex ratio 0.98) 10–13 months after the diagnosis at a mean age of 9.1 years. None developed paediatric inflammatory multisystem syndrome or myocarditis. Most (83.2%) completely recovered and 16.8% had symptoms of long COVID-19: 10/23 had persistent symptoms and 13/23 had new late-onset symptoms, which appeared long after the acute infection, at a mean of 180 days (range 36–345). Those who were symptomatic during the acute phase were statistically significantly more susceptible to develop long-term symptoms ($p = 0.038$) (Table 1). The most common long COVID-19 symptoms were asthenia (9.5%), learning difficulties (8.0%) and headache (5.8%). One 13-year-old adolescent with acute leukaemia had a bone marrow transplant 3 months after recovering from COVID-19 and died from idiopathic acute respiratory distress syndrome 6 months after the bone marrow transplantation.

Most of the children presented as outpatients after household exposure and had mild symptoms.[1] There were no significant viral load differences by age group and severity. And the vast majority

Abbreviations: SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

TABLE 1 Persisting symptoms according to symptomatic acute COVID, hospitalisation and age groups

	Persisting symptoms			
	Yes	No	OR (95% CI)	*p*-Value
All, *N* = 137	23 (16.8%)	114 (83.2%)		
According to acute symptoms				
Symptomatic, *N* = 99	21 (21.2%)	78 (78.8%)	4.80 (1.08–4.49)	**.038**
Asymptomatic, *N* = 38	2 (5.3%)	36 (94.7%)		
According to hospitalisation				
Hospitalised, *N* = 19	6 (31.6%)	13 (68.4%)	2.72 (0.74–9.04)	.092
Not hospitalised, *N* = 118	17 (14.4%)	101 (85.6%)		
According to age group				
<3 m, *N* = 4	1 (25.0%)	3 (75.0%)		.179
3 m–1 y, *N* = 4	0 (0.0%)	4 (100.0%)		
1–3 y, *N* = 10	0 (0.0%)	10 (100.0%)		
3–6 y, *N* = 18	2 (11.1%)	16 (88.9%)		
6–10 y, *N* = 25	3 (12.0%)	22 (88.0%)		
10–14 y, *N* = 50	8 (16.0%)	42 (84.0%)		
14–16 y, *N* = 26	9 (34.6%)	17 (65.4%)		

had favourable outcomes with no viral fatalities. About a sixth had persistent and/or recurrent symptoms after COVID-19,[2-5] but had no inflammatory complications.[2] Asthenia was the most common persisting symptom. Children with symptomatic acute COVID-19 were significatively more susceptible to develop long-term symptoms.

In conclusion, open screening helped to detect asymptomatic carriers and moderately ill paediatric patients, especially when there were family clusters. This approach is enabling us to provide better clinical follow-up, including appropriate counselling and household isolation, especially if children have inflammatory complications or long COVID.

CONFLICT OF INTEREST

None.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.