

BRIEF REPORT

Spectrum of COVID-19 in children

The prevalence of coronavirus disease 2019 (COVID-19) is lower in children compared with adults. Children contribute to 1%-5% of all COVID-19 cases.¹ A recent study from China reported that 171 (12.3%) of 1391 children with suspected disease had confirmed COVID-19 infection.² As of May 15, 2020, there are 33,241 children with COVID-19 in the United States.³ The most common symptoms in children with confirmed and suspected COVID-19 include fever and cough followed by diarrhoea and abdominal pain. A very few children developed critical illness coagulopathy, respiratory failure, shock and renal injury.⁴ Severe manifestations of COVID-19 are reported in children younger than 1 year of age and children with comorbid conditions.⁴ The majority of children with COVID-19 in the United States that required hospitalisation had one or more underlying medical conditions such as chronic lung disease, cardiovascular disease and immunosuppression.⁵ Despite the available limited information, COVID-19 in children poses a significant challenge due to the atypical/asymptomatic presentations and role in community transmission. Knowledge regarding the clinical characteristics and disease burden in children is critical at this stage of the pandemic for better treatment, control of transmission and appropriate allocation of healthcare resources. Data regarding organ system-specific involvement of COVID-19 are lacking.

We used TriNetX, a global health collaborative clinical research platform that collects real-time electronic medical record data from various healthcare organisations. Our search criteria included children from 0 to 18 years of age with a confirmed laboratory diagnosis of COVID-19 from January 20, 2020, to June 10, 2020. We used laboratory codes to identify children with confirmed COVID-19 and to gather information on symptoms and organ system involvement. We used a time constraint of 1 month in the search criteria for any new diagnoses reported on or after the diagnosis of COVID-19. We analysed the data based on age, demographic distribution, symptoms and organ system involvement. There were a total of 1353 children in the database that met the aforementioned criteria. Demographics and clinical characteristics of these patients are described in Table 1. The most common symptoms include fever and cough. Interestingly, loss of smell/taste sensation was reported only in a minority of children and they were 11 years or older. This might be related to the inability of younger children to express this peculiar symptom. About organ system involvement, the majority of the children had respiratory system involvement with acute upper respiratory infection being the most common diagnosis. Cardiac involvement was reported in 6.4% of the children with acute myocardial infarction and myocarditis in ≤ 10 children each. Kawasaki disease was

TABLE 1 Presentations of children in COVID-19

Characteristics	N = 1353 (100%)
Age distribution- no. (%)	
<1 y	155 (11.4%)
1-5 y	284 (21%)
6-10 y	205 (15.2%)
11-18 y	709 (52.4%)
Sex - no. (%)	
Female	659 (49%)
Male	694 (51%)
Race- no. (%)	
White	455 (34%)
Black or African American	223 (16%)
Asian	29 (2%)
Unknown Race	646 (48%)
Ethnicity- no. (%)	
Not Hispanic or Latino	297 (22%)
Unknown	789 (58%)
Hispanic or Latino	267 (20%)
Hospital admission- no. (%)	
Inpatient/Observation	260 (19.2%)
Intensive Care Unit (ICU)	26 (1.9%)
Symptoms - no. (%)	
Fever	293 (21.7%)
Cough	209 (15.4%)
Abnormal breathing	109 (8.1%)
Sore throat	58 (4.3%)
Abdominal/pelvic pain	56 (4.1%)
Headache	54 (4.0%)
Nausea/Vomiting	45 (3.3%)
Diarrhea	42 (3.1%)
Concerning food/fluid intake	36 (2.7%)
Rash and other skin eruptions	36 (2.7%)
Malaise/Fatigue	33 (2.4%)
Loss of smell/taste	28 (2.1%)
Myalgias	22 (1.6%)
Emotional disturbances	19 (1.4%)
Nasal congestion	15 (1.1%)

(Continues)

TABLE 1 (Continued)

Characteristics	N = 1353 (100%)
Convulsions	≤10 (≤0.7%)
Dizziness	≤10 (≤0.7%)
Non-specific symptoms of Infancy	≤10 (≤6.5% of Infants)
Organ system involvement- no. (%)	
Respiratory system	400 (29.6%)
Acute upper respiratory infection	150 (11.1%)
Intubation	≤10 (≤0.7%)
Endocrine/Nutritional/Metabolic	116 (8.6%)
Disorders of blood & immune system	103 (7.6%)
Circulatory system	87 (6.4%)
Acute MI	≤10 (≤0.7%)
Myocarditis	≤10 (≤0.7%)
Digestive system	83 (6.1%)
Musculo-skeletal/Connective Tissue	82 (6.1%)
Kawasaki Disease	16 (1.2%)
Toxic shock syndrome	0 (0%)
Mental/Behavioral disorders	65 (4.8%)
Anxiety disorders	19 (1.4%)
Mood disorders	22 (1.6%)
Nervous system	62 (4.6%)
Sleep disorders	16 (1.2%)
Stroke	≤10 (≤0.7%)
GBS	0 (0%)
Skin and subcutaneous tissue	49 (3.6%)
Vasculitis limited to skin	0 (0%)
Genito-urinary system	47 (3.5%)
Acute kidney Injury	12 (0.9%)
Dialysis	≤10 (≤0.7%)
Mortality	≤10 (≤0.7%)

reported in only 16 of the 1353 children. We were unable to obtain data on the multisystem inflammatory syndrome in children (MIS-C) reported with COVID-19 as there is no International Classification of Diseases (ICD)-10 diagnosis code for it.

We describe the clinical characteristics of children with confirmed COVID-19 based on the data available in the largest database to date. The available information confirms multiple organ system involvement in children with COVID-19 and only minority of children require hospitalisation and/or critical care. As this report is based on ICD-10 codes entered from the electronic medical record, one should be cautious about establishing causation. Individual patient-level data including outcomes could not be ascertained due to the nature of this study. Further systematic studies are needed to better understand the organ system-specific manifestations of COVID-19 in children, management and clinical outcomes.

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CONFLICT OF INTEREST

All authors have no conflicts of interest to disclose.

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