

# Journal Reading

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The NEW ENGLAND JOURNAL of MEDICINE

CORRESPONDENCE

**SARS-CoV-2 Infection in Children**

# SARS-CoV-2 Infection in Children

- ▶ 72,314 cases by the Chinese Center for Disease Control and Prevention => **less than 1%** of the cases ( < 10 years old )
- ▶ Wuhan Children's Hospital
- ▶ Both **symptomatic** and **asymptomatic** children with known contact with persons
- ▶ **Nasopharyngeal** or **throat swabs** were obtained for detection of SARS-CoV-2 RNA
- ▶ outcomes were monitored up to **March 8, 2020**.

# Methods

- ▶ Observational study in Wuhan Children's Hospital located in Wuhan
- ▶ All the children tested positive for SAR-CoV-2
- ▶ January 28 to February 26, 2020
- ▶ The natural history and clinical outcomes => March 8, 2020
- ▶ Nasopharyngeal swabs from suspected children younger than 2 years of age and throat swabs from children 2 years or older were obtained for detection of SAR-CoV-2 RNA
- ▶ transported to the laboratory within 2 hours

**Table 1.** Epidemiologic Characteristics, Clinical Features, and Radiologic Findings of 171 Children with SARS-CoV-2 Infection.\*

Characteristic	Value
Age	
Median (range)	6.7 yr (1 day–15 yr)
Distribution — no. (%)	
<1 yr	31 (18.1)
1–5 yr	40 (23.4)
6–10 yr	58 (33.9)
11–15 yr	42 (24.6)
Sex — no. (%)	
Male	104 (60.8)
Female	67 (39.2)
Diagnosis — no. (%)	
Asymptomatic infection	27 (15.8)
Upper respiratory tract infection	33 (19.3)
Pneumonia	111 (64.9)

Table 1. (Continued)

Characteristic	Value
Exposure or contact information — no. (%)	
Family cluster	154 (90.1)
Confirmed family members	131 (76.6)
Suspected family members	23 (13.5)
Unidentified source of infection	15 (8.8)
Contact with other suspected case	2 (1.2)
Signs and symptoms	
Cough — no. (%)	83 (48.5)
Pharyngeal erythema — no. (%)	79 (46.2)
Fever — no. (%)	71 (41.5)
Median duration of fever (range) — days	3 (1–16)
Highest temperature during hospitalization — no. (%)	
<37.5°C	100 (58.5)
37.5–38.0°C	16 (9.4)
38.1–39.0°C	39 (22.8)
>39.0°C	16 (9.4)

Diarrhea — no. (%)	15 (8.8)
Fatigue — no. (%)	13 (7.6)
Rhinorrhea — no. (%)	13 (7.6)
Vomiting — no. (%)	11 (6.4)
Nasal congestion — no. (%)	9 (5.3)
Tachypnea on admission — no. (%) †	49 (28.7)
Tachycardia on admission — no. (%) ‡	72 (42.1)
Oxygen saturation <92% during period of hospitalization — no. (%)	4 (2.3)
Abnormalities on computed tomography of the chest — no. (%)	
Ground-glass opacity	56 (32.7)
Local patchy shadowing	32 (18.7)
Bilateral patchy shadowing	21 (12.3)
Interstitial abnormalities	2 (1.2)

**Table S1. Age distribution of infected children and their respective diagnoses**

	n (%) or median (IQR)			
	All patients (n = 171)	Asymptomatic infection (n=27)	Upper respiratory tract infection (n = 33)	Pneumonia (n =111)
<b>Age -years</b>				
Median (IQR)	6.7 (2.0-9.8)	9.6 (7.6-12.6)	3.9 (1.4-8.4)	5.9 (1.2-9.3)
<1	31 (18.1)	0	6 (18.2)	25 (22.5)
1-5	40 (23.4)	1 (3.7)	12 (36.4)	27 (24.3)
6-10	58 (33.9)	14 (51.9)	10 (30.3)	34 (30.6)
11-15	42 (24.6)	12 (44.4)	5 (15.2)	25 (22.5)



Table S2. Laboratory results of 171 infected children and their respective diagnoses

Measures	All patients (n = 171)	Diagnosis		
		Asymptomatic infection (n=27)	Upper respiratory tract infection (n = 33)	Pneumonia (n =111)
<b>Blood routine (unit; normal range)</b>				
White blood cell count ( $\times 10^9/L$ ; 5.5-12.0)	6.8 (5.5-8.2)	7.0 (6.1-8.1)	6.9 (5.5-8.6)	6.6 (5.3-8.2)
<5.5	45/171 (26.3)	1/27 (3.7)	9/33 (27.3)	35/111 (31.5)
Neutrophil count ( $\times 10^9/L$ ; 1.1-3.9)	2.5 (1.8-3.7)	3.4 (2.9-3.9)	2.5 (1.7-3.9)	2.3 (1.6-3.5)
Lymphocyte count ( $\times 10^9/L$ ; 1.2-6.0)	2.9 (2.2-4.4)	2.8 (2.4-3.3)	3.1 (2.6-4.6)	2.9 (1.9-4.5)
<1.2	6 (3.5)	0(0)	1(3.0)	5(4.5)
Hemoglobin (g/L; 110.0-149.0)	126.0 (118.0-135.0)	132.0 (125.0-135.0)	128.0 (121.0-138.0)	125.0 (115.0-133.0)
<b>Infection biomarkers (unit; normal range)</b>				
Procalcitonin (pg/ml; 0-46) *	50 (40-80)	40 (30-50)	50 (40-80)	60.0 (40-90)
>46	105 (64.0)	10 (40.0)	22 (68.8)	73 (68.2)
C-reactive protein (mg/L; 0.0-10.0)	4.0 (1.3-8.0)	2.0 (1.0-4.0)	4.0 (1.3-6.8)	4.0 (1.7-9.0)
>10	33 (19.7)	2 (7.4)	4 (12.1)	27 (24.3)
<b>Blood biochemistry (unit; normal range)</b>				
Lactate dehydrogenase (U/L; 120.0-300.0)	246 (207-305)	215 (181-254)	243 (215-323)	254 (216-329)
Alanine aminotransferase (U/L; 7-45)	15 (11-27)	13 (11-20)	13 (11-28)	16 (11-28)
Increased	21 (12.3)	1 (3.7)	4 (12.1)	16 (14.4)
Aspartate aminotransferase (U/L; 10-50)	30 (24-42)	25 (20-31)	30 (24-46)	32.0 (24-46)
>50	25 (14.6)	0 (0)	5 (15.2)	20 (18.0)
Alkaline phosphatase (U/L; 42.0-220.0)	198.0 (156.0-245.0)	202.0 (126.0-239.0)	186.0 (165.0-217.0)	198.0 (158.0-256.0)
Creatinine ( $\mu\text{mol/L}$ ; 27.0-62.0)	33.9 (26.1-42.7)	42.6 (36.4-47.1)	29.0 (23.3-39.7)	31.7 (25.8-42.0)
Blood urea nitrogen (mmol/L; 2.9-7.1)	4.1 (3.3-4.8)	4.7 (3.6-5.5)	4.1 (3.4-4.4)	4.1 (3.1-4.8)

**Coagulation markers (unit; normal range)**

Fibrinogen (g/L; 2.0-4.0)	2.1 (1.8-2.7)	1.8 (1.8-2.0)	2.2 (1.9-2.8)	2.1 (1.8-2.8)
D-dimer (mg/LFEU; 0.0-0.6) #	0.2 (0.2-0.4)	0.2 (0.1-0.2)	0.2 (0.2-0.4)	0.4 (0.3-1.0)
>0.6	21 (14.1)	0 (0)	4 (16.0)	17 (17.5)
Prothrombin time (s; 10.2-13.4)	10.9 (10.6-11.3)	10.9 (10.6-11.1)	10.8 (10.6-11.5)	11.0 (10.6-11.3)
Thrombin time (s; 14.0-21.0)	18.4 (17.7-19.2)	18.5 (17.9-19.0)	18.2 (17.7-18.7)	18.5 (17.7-19.4)

**Electrolytes (unit; normal range)**

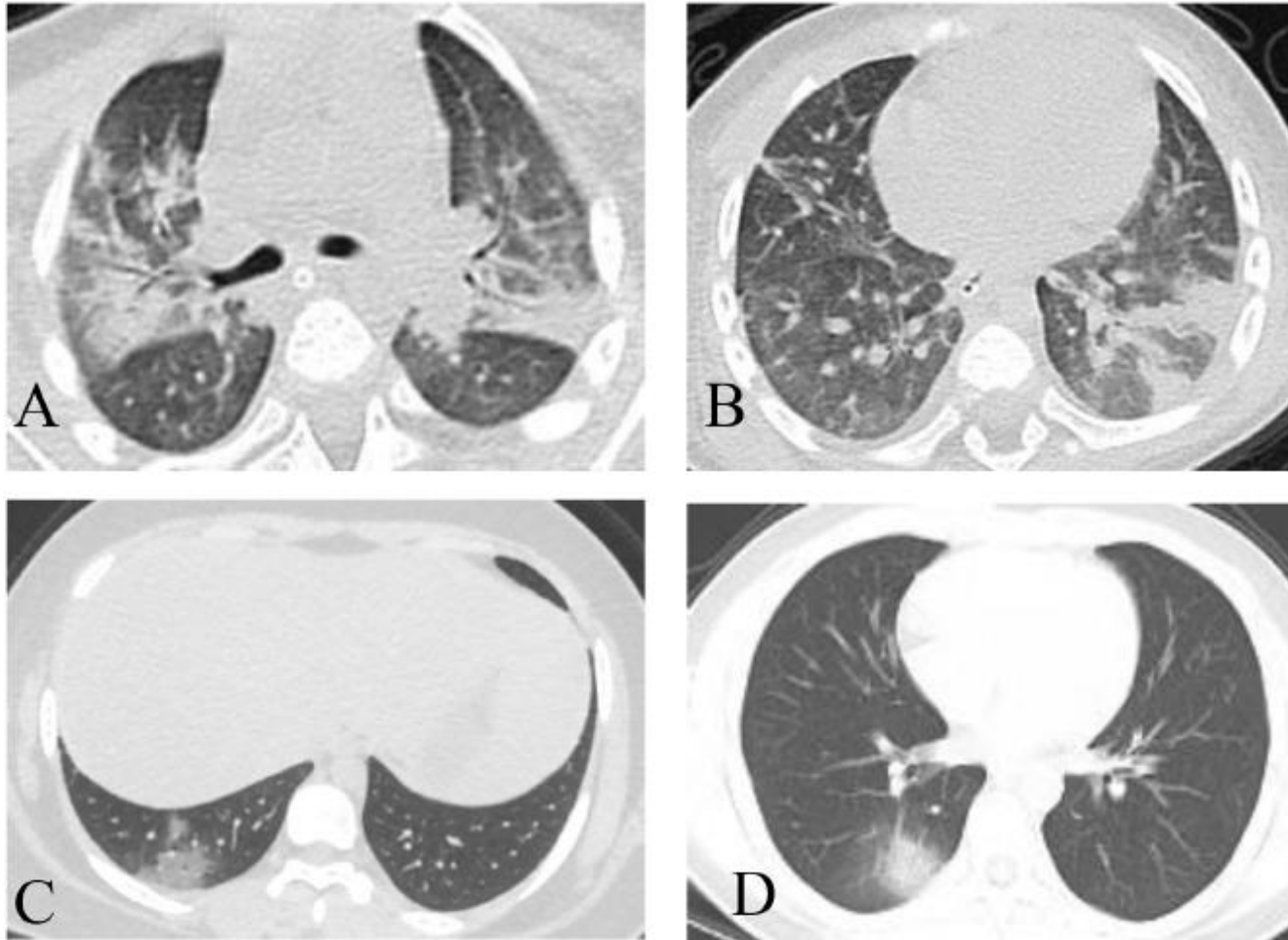
Potassium (mmol/L; 3.5-5.3)	4.8 (4.3-5.2)	4.4 (4.3-4.7)	4.8 (4.3-5.6)	4.8 (4.4-5.2)
Sodium (mmol/L; 137.0-147.0)	139.1 (138.0-140.5)	140.4 (139.5-141.6)	139.1 (138.2-140.2)	138.9 (137.6-140.1)
Chloride (mmol/L; 99.0-110.0)	101.3 (99.7-103.0)	100.5 (99.9-102.9)	101.8 (99.7-103.1)	101.1 (99.5-103.0)

\*Procalcitonin was available from 164 patients (25 patients with asymptomatic infection, 32 patients with upper respiratory tract infection, 107 patients with pneumonia)

#D-dimer was available from 149 patients (27 patients with asymptomatic infection, 25 patients with upper respiratory tract infections and 97 patients with pneumonia)

**Figure S1. Chest CT scan images of representative patients.**

Representative chest CT scan images from patients with different severity of the infection. Bilateral ground glass opacities in a thirteen-month old boy with severe pneumonia requiring ICU care (A, B). Chest CT scan image from a 14-year old girl showing basal infiltrates (C). Chest CT scan image from a 15-year old asymptomatic boy showing ground glass opacity in the right posterior lung field.



# SARS-CoV-2 Infection in Children

- ▶ 2020/01/28-2020/02/26  
=> **171 (12.3%)** were confirmed to have SARS-CoV-2 infection.
- ▶ 27 patients (15.8%)  
=> **No symptoms** of infection + **No radiologic features of pneumonia.**
- ▶ 12 patients (7%) => **radiologic features** of pneumonia & **No symptom**
- ▶ 3 patients => intensive care support and invasive mechanical ventilation
- ▶ 6 patients (3.5%)  
=> **Lymphopenia** (lymphocyte count,  $<1.2 \times 10^9/L$ )

# SARS-CoV-2 Infection in Children

- ▶ 21 patients => **stable condition** in the general wards
- ▶ 149 patients=> **have been discharged** from the hospital.
- ▶ A 10-month-old child with intussusception had multiorgan failure and died 4 weeks after admission
- ✓ **most infected children appear to have a milder clinical course**
- ✓ **Determination of the transmission potential of these asymptomatic patients is important for guiding the development of measures to control the ongoing pandemic.**

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OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## **COVID-19 in Children: Initial Characterization of the Pediatric Disease**

Andrea T. Cruz and Steven L. Zeichner

*Pediatrics* originally published online March 16, 2020; originally published online  
March 16, 2020;

The online version of this article, along with updated information and services, is  
located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/early/2020/03/16/peds.2020-0834.1>

# COVID-19 in Children: Initial Characterization of the Pediatric Disease

- ▶ the findings of *Dong et al*, who reported in this issue of Pediatrics a series of **>2000 children** with **suspected or confirmed COVID-19**
- ▶ **4%** of virologically confirmed cases had **asymptomatic infection**
- ▶ almost certainly **understates** the true rate of asymptomatic infection
- ▶ **5%** had dyspnea or hypoxemia, & **0.6%** progressed to acute respiratory distress syndrome or multiorgan system dysfunction
- ▶ **Preschool-aged children & infants** were more likely than older children to have severe clinical manifestations.

# COVID-19 in Children: Initial Characterization of the Pediatric Disease

- ▶ Children=>an increased risk for **more significant illness**
- ✓ China report => **coronavirus** was detected in more children with acute respiratory distress syndrome than **human metapneumovirus**
- ✓ Norwegian children=> 10% of hospitalized children with respiratory tract infections
- ▶ Attributable risk for severe disease from COVID-19 in children is **challenging to discern**
- ✓ viral **coinfections** in up to two-thirds of cases
- ▶ Children may play a major role in **community-based viral transmission**



# COVID-19 in Children: Initial Characterization of the Pediatric Disease

- ▶ Children may play a major role in **community-based viral transmission**
- ✓ have **more upper respiratory tract involvement** (including nasopharyngeal carriage) rather than lower respiratory tract involvement
- ✓ fecal-oral transmission=>children who are **not toilet trained, and viral replication in the gastrointestinal tract**
- ✓ Prolonged shedding=>in child care centers, schools, and home
- ✓ non-COVID-19 coronaviruses are **detectable** in respiratory secretions in a large percentage of **healthy children**

# COVID-19 in Children: Initial Characterization of the Pediatric Disease

- ▶ **vertical transmission** has not yet been reported
- ▶ many of the infants born to mothers infected with COVID-19 were **delivered surgically and quickly separated** from their mothers
- ▶ Pregnant women may result in **poor fetal outcomes.**
- ▶ Many infectious diseases affect **children differently from adults**, and understanding those differences can yield important insights into disease pathogenesis, informing management and the development of therapeutics



**Thank you for your  
attention !!**