

Coronavirus Disease 2019 in Children: An Invisible Threat Which We Cannot Ignore

Paolo Biban, MD

Department of Neonatal and Pediatric Critical Care
University Hospital of Verona
Verona, Italy

The severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is a novel coronavirus which emerged in December 2019 in Wuhan, Hubei Province, China. This highly pathogenic virus has rapidly spread around the world resulting in a global pandemic called coronavirus disease 2019 (COVID-19) (1). Although some subjects with SARS-CoV-2 infection may remain asymptomatic, the clinical picture is generally associated with upper respiratory tract infections, with flu-like signs and symptoms including fever, persistent dry cough, fatigue, and headache (2). However, some patients (mostly adults) may suffer severe forms characterized by lower respiratory tract infections, pneumonia, dyspnea, multiple organ failure, and even death (3). Sadly, as of April 6th, COVID-19 has already caused over 1.3 million confirmed positive cases and over 74,000 deaths worldwide. Italy has suffered the highest lethal toll so far, with over 16,000 deaths (1, 4). Interestingly, newborns and children seem to be relatively spared of severe symptoms of COVID-19, even though the reasons for such phenomenon remain unclear (5, 6).

Nonetheless, severe cases may occasionally occur also in the pediatric population and few deaths have been reported from China and elsewhere (7).

In this issue of *Pediatric Critical Care Medicine*, Ong et al (8) provide a comprehensive narrative review on the impact and implications of COVID-19 in children, focusing on the management of those most severely affected, as well as providing some practical suggestions for pediatric intensive care clinicians to prepare should COVID-19 become more virulent in children. We are still in the early stages of understanding this disease in children and appropriately the authors raise a number of issues which warrant further extensive research. Indeed, the scientific community is committed to better understanding of the clinical course of children with COVID-19, particularly of those who may need intensive care. However, very scant data are available on specific interventions which may improve outcomes in the

sickest children. Current information are mostly derived from the adult experience and several important questions pertaining to critically ill children remain unanswered.

HOW MANY CHILDREN WITH COVID-19 INFECTION MAY REQUIRE INTENSIVE CARE?

In adults, about 5% of subjects infected by SARS-CoV-2 require admission in ICU (9). Among hospitalized patients, the frequency of ICU admission may increase up to 25–30% (2). Conversely, we have little information on severely and critically ill children with COVID-19. According to the largest series reported so far, by Dong et al (7), only two children out of 2,143 required intensive care. Thus, the frequency of critically ill children could have been about 0.4% if considering confirmed positive cases only, or 0.6% if considering the whole population, including suspected and confirmed cases.

In another small series, reporting on eight severe pediatric cases with coronavirus in Wuhan, only two patients were mechanically ventilated and none died (10). Even if the overall frequency of severe cases was not reported, by analyzing a population of 171 children with proven SARS-CoV-2 infection, enrolled nearly in the same period and in the same hospital (11), it could be estimated an frequency of about 1.2% of children requiring invasive mechanical ventilation.

In Italy, until April 2, 2020, only 84 out of 1,078 subjects (7.8%), less than 18 years old and with laboratory-confirmed SARS-CoV-2 infection, were hospitalized. Admission rate varied from 11.5% to 3.9% in the age subgroup 0–1 years and in the subgroup 7–17 years, respectively (12). Even though official reports were not available at the time of writing, unpublished data from the Italian PICU Network (TIPNET) indicate that less than five children did require intensive care interventions, such as invasive mechanical ventilation, at least so far. Thus, from a rough estimate in excess, one could expect an frequency of critically ill children as low as 0.4–0.5%, comparable to the figures reported by Dong et al (7). However, the situation may be different in low- and middle-income countries where social distancing is difficult and malnutrition, tuberculosis and HIV infection is more common.

WHAT ABOUT RISK FACTORS AND SPECIFIC BIOMARKERS TO EARLY PREDICT OR IDENTIFY MOST SEVERELY ILL CHILDREN WITH COVID-19?

Early detection of children who are likely to deteriorate and suffer critical illness would be useful for clinicians, as a prompt

Key Words: child; coronavirus disease 2019; intensive care; severe acute respiratory syndrome coronavirus-2

Dr. Biban received funding from Chiesi Pharmaceutical and Getinge.

Copyright © 2020 by the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies

DOI: 10.1097/PCC.0000000000002431

admission to ICUs would allow advanced monitoring and potentially useful treatments.

In adults, patients who required ICU care are generally older and more likely to have underlying comorbidities, including hypertension, diabetes, cardiovascular disease, cerebrovascular disease, or malignancy (2, 9). At present, no obvious risk factors for children have been identified. Plausibly, pediatric subjects with severe comorbidities should have a higher risk for more complicated COVID-19 courses, but evidence to confirm such an assumption are still lacking.

Similarly, laboratory findings do not seem to be helpful in discriminating children most severely affected by COVID-19, as a consistent pattern of altered laboratory values has not been identified yet (13). For instance, severe and persistent lymphopenia has not emerged as a specific marker for a complicated COVID-19 course in children, differently from adults (2, 11, 13). Similarly, other markers do not seem either specific or predictive of adverse outcome in children (13).

ARE THERE SPECIFIC THERAPEUTIC INTERVENTIONS FOR CRITICALLY ILL CHILDREN WITH COVID-19?

Many antiviral and other agents are being used in adult patients with COVID-19, including remdesivir, lopinavir/ritonavir, tocilizumab, chloroquine, and even traditional Chinese therapy. Although several clinical trials are being conducted, results are unavailable and current data situation does not allow firm recommendations for any particular treatment. At present, management is as per best supportive care for any respiratory disease. Similar considerations may be applied to children as well, with the awareness that conducting clinical intervention trials could be even more difficult in this population, given the paucity of severe cases observed so far.

The authors must be congratulated on being able to provide very useful information for clinicians who must deal with critically ill children with COVID-19, particularly for those who are still in an early organizational phase. In addition, Ong et al (8) identified several knowledge gaps between evidence and practice in the management of the sickest pediatric patients with COVID-19 which is a good start in our collaborative efforts.

Several large collaborative pediatric studies are on the horizon, as intensivists from all over the world are responding in an unprecedented way and working together as a scientific community to find smart solutions to fight against this dreadful virus while waiting for a safe and effective vaccine. Finally,

not to be forgotten, leader groups should play an essential role for actively supporting our colleagues and other healthcare providers working in low- and middle-income countries (14), where pediatric populations may be more vulnerable to this pandemic.

REFERENCES

1. World Health Organization: Coronavirus Disease 2019 (COVID-19) Situation Report – 73. 2020. Available at: https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_4. Accessed April 6, 2020
2. Wang D, Hu B, Hu C, et al: Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA* 2020 Feb 7. [online ahead of print]
3. Guan WJ, Ni ZY, Hu Y, et al: Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020 Feb 28. [Epub ahead of print]
4. Italian National Institute of Health (Istituto Superiore di Sanità): Integrated surveillance of COVID-19 in Italy. 2020. Available at: https://www.epicentro.iss.it/en/coronavirus/bollettino/Infografica_6aprile%20ENG.pdf. Accessed April 6, 2020
5. Ludvigsson JF: Systematic review of COVID-19 in children show milder cases and a better prognosis than adults. *Acta Paediatrica* 2020 Mar 23. [online ahead of print]
6. Chen H, Guo J, Wang C, et al: Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: A retrospective review of medical records. *Lancet* 2020; 395:809–815
7. Dong Y, Mo X, Hu Y, et al: Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. *Pediatrics* 2020 Mar 16. [online ahead of print]
8. Ong JSM, Tosoni A, Kim YJ, et al: Coronavirus Disease 2019 in Critically Ill Children: A Narrative Review of the Literature. *Pediatr Crit Care Med* 2020 Apr 7. [online ahead of print]
9. Wu Z, McGoogan JM: Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. *JAMA* 2020 Feb 24. [online ahead of print]
10. Sun D, Li H, Lu XX, et al: Clinical features of severe pediatric patients with coronavirus disease 2019 in Wuhan: A single center's observational study. *World J Pediatr* 2020 Mar 19. [online ahead of print]
11. Lu X, Zhang L, Du H, et al; Chinese Pediatric Novel Coronavirus Study Team: SARS-CoV-2 infection in children. *N Engl J Med* 2020 Mar 18. [online ahead of print]
12. Italian National Institute of Health (Istituto Superiore di Sanità): Epidemia COVID-19. 2020. Available at: https://www.epicentro.iss.it/coronavirus/bollettino/Bollettino-sorveglianza-integrata-COVID-19_2-aprile-2020.pdf. Accessed April 6, 2020
13. Henry BM, Lippi G, Plebani M: Laboratory abnormalities in children with novel coronavirus disease 2019. *Clin Chem Lab Med* 2020 Mar 16. [online ahead of print]
14. Bong CL, Brasher C, Chikumba E, et al: The COVID-19 pandemic: Effects on low and middle-income countries. *Anesth Analg* 2020 Apr 1. [online ahead of print]