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

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The impact of the coronavirus disease of 2019 (COVID-19), which is caused by the novel coronavirus, severe acute respiratory syndrome coronavirus 2,[1] has been widespread, with >500 000 cases diagnosed in >170 countries since the virus was identified in January 2020.[2] The preliminary data have been focused on severe respiratory manifestations, which are seen predominantly in adults, with scant initial data on the burden of COVID-19 in children.[3] We, therefore, read with interest the findings of Dong et al,[4] who reported in this issue of *Pediatrics* a series of >2000 children with suspected or confirmed COVID-19. The authors found that 4% of virologically confirmed cases had asymptomatic infection, and this rate almost certainly understates the true rate of asymptomatic infection because many children who are asymptomatic are unlikely to be tested. Among children who were symptomatic, 5% had dyspnea or hypoxemia (a substantially lower percentage than what has been reported for adults[3]), and 0.6% progressed to acute respiratory distress syndrome or multiorgan system dysfunction (a rate that is also lower than that seen in adults). Preschool-aged children and infants were more likely than older children to have severe clinical manifestations.

There are several salient points from this article. First, although children are less likely than older adults to become severely ill, there are subpopulations of children with an increased risk for more significant illness. These data on disease severity are consistent with data on non-COVID-19 coronaviruses. The authors of one viral surveillance study in a PICU in China reported that coronavirus was detected in more children with acute respiratory distress syndrome than human metapneumovirus.[5] The authors of another study conducted on hospitalized Norwegian children detected coronaviruses in 10% of hospitalized children with respiratory tract infections.[6] Younger age, underlying pulmonary pathology, and immunocompromising conditions have been associated with more severe outcomes with non-COVID-19 coronavirus infections in children.[7]

Second, the attributable risk for severe disease from COVID-19 in children is challenging to discern. Previous studies have revealed that children from whom coronaviruses are detected from the respiratory tract can have viral co-infections in up to two-thirds of cases.[6] In the study by Dong et al,[4] testing for other viruses was not standardized, and two-thirds of cases were clinically diagnosed, not virologically confirmed. In addition, children without virological confirmation were more likely to have severe disease than children from whom COVID-19 was detected, potentially because their symptoms were caused by other pathogens.

Third, children may play a major role in community-based viral transmission. Available data suggest that children

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may have more upper respiratory tract involvement (including nasopharyngeal carriage) rather than lower respiratory tract involvement.[4] There is also evidence of fecal shedding in the stool for several weeks after diagnosis,[8] leading to concern about fecal-oral transmission of the virus, particularly for infants and children who are not toilet trained, and viral replication in the gastrointestinal tract.[9] Prolonged shedding in nasal secretions and stool has substantial implications for community spread in child care centers, in schools, and in the home. Additionally, non-COVID-19 coronaviruses are detectable in respiratory secretions in a large percentage of healthy children,[6] and the extent to which this is also seen in COVID-19 is unclear. Prolonged viral shedding in individuals who are symptomatic, combined with shedding in persons who are asymptomatic, would render contact tracing and other public health measures to mitigate spread less effective.

We have learned an amazing amount about COVID-19 in a short amount of time, with copious epidemiological, virological, and clinical data being published. The severe acute respiratory syndrome coronavirus 2 sequence, now published,[10] was first posted to the bioRχiv preprint server a remarkable 6 weeks after the start of the epidemic, enabling the essential work of molecular epidemiology. The transmission of data has been surpassed only by the transmission of the virus itself. However, there is still much that we need to learn about the impact of this virus on children as well as the impact of children on viral spread. Although vertical transmission has not yet been reported,[11] many of the infants born to mothers infected with COVID-19 were delivered surgically and quickly separated from their mothers. Many infectious diseases affect pregnant women more severely, and respiratory disease in pregnant women may result in poor fetal outcomes. Data on the basic reproductive number of the virus (the number of persons to whom an individual who is infected transmits the virus) have varied widely,[12,13] and household studies can be used to refine the data we have on viral transmission and viral shedding. Widespread availability of testing will allow for us to more accurately describe the spectrum of illness and may result in the adjustment of the apparent morbidity and mortality rate as individuals who are less ill are diagnosed. Although the focus for pandemics is often on the impact on the persons who use the highest resources or on the economically productive age groups, rigorously gauging the impact of COVID-19 on children will be important to accurately model the pandemic and to ensure that appropriate resources are allocated to children requiring care. 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. This will likely be true for COVID-19, just as it was for older infectious diseases.

ABBREVIATION

COVID-19: coronavirus disease of 2019

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