

Kids with COVID have more viral RNA in their airways than adults do

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A study published yesterday in the *Journal of Pediatrics* found that 49 Massachusetts children and young adults 0 to 22 years with COVID-19 had significantly higher levels of virus RNA in their airways than did infected adults in intensive care units, suggesting that the novel coronavirus doesn't spare young people and that they could spread it just as easily.

In addition to the 49 subjects who tested positive for COVID-19, another 18 had the delayed, coronavirus-linked multisystem inflammatory syndrome in children (MIS-C).

Regardless of a child's age, airway viral RNA load of those with COVID-19 was highest in the first 2 days of symptoms, much higher than in severely ill adults ($P = 0.002$), and some had high viral loads even before symptoms appeared. But unlike subjects with COVID-19, those with MIS-C did not have high viral loads. The researchers didn't attempt to isolate live virus.

Nonspecific symptoms, ACE2 expression

Subjects 11 to 16 years made up 33% of the coronavirus-positive cohort, while 37% were younger than that and 27% were older. The average age was 13, and the authors did not specify the age of 2 of the 49 SARS-CoV-2-positive patients.

In contrast, children 1 to 4 years old accounted for 39% of the MIS-C group, which had a male predominance (78%). Youth with severe MIS-C tended to have strong immune responses to different respiratory viruses, including other coronaviruses, respiratory syncytial virus, and flu.

COVID-19 patients aged 10 and older had higher expression of angiotensin-converting enzyme 2 (ACE2), which did not correlate with viral airway load but could have made them more vulnerable to infection. Children younger than 10 years, however, tended to have lower ACE2 expression, which likely conferred some protection against infection.

Twenty-five children (51%) had fever, 23 (47%) had cough, 17 (35%) had congestion, 17 (35%) had a sore throat, 14 (29%) had a runny nose, 13 (27%) had headache, and 10 (20%) had loss of smell. These nonspecific symptoms suggest that it would be a mistake to rely on symptoms or temperature checks to detect COVID-19 infection, the authors said.

Thirteen patients (27%) were obese, and 29 (19%) had asthma. Nine (18%) of children with COVID-19 and 10 (56%) of those with MIS-C had no known infected household member. Twenty-six (53%) attended grade school.

'Healthy children' with high viral loads

High viral RNA loads may indicate greater infectiousness, the authors said. And because children tend to have mild or no symptoms when infected with SARS-CoV-2, the virus that causes COVID-19, and many symptoms overlap with common childhood diseases such as the flu and the common cold, they could spread the virus undetected—which could complicate diagnosis during the upcoming seasonal allergy and flu season.

In a Massachusetts General Hospital news release, lead author Lael Yonker, MD, said she was surprised by the study findings. "You think of a hospital, and of all of the precautions taken to treat severely ill adults, but the viral loads of these hospitalized patients are significantly lower than a 'healthy child' who is walking around with a high SARS-CoV-2 viral load," she said.

The authors said that the numbers of young people who develop MIS-C after coronavirus infection are growing. The result of an abnormal immune response to the virus, the syndrome can cause serious heart problems and shock. "Children can develop severe illness during the post-infectious stage with a hyperinflammatory antibody response," they wrote. "Potential transmission of SARS-CoV-2 between children and families should be considered when designing strategies to mitigate the COVID-19 pandemic."

Last month, a research letter in *JAMA Pediatrics* showed that children younger than 5 years with mild or moderate COVID-19 have much higher levels of viral RNA in their nose and throat than do older children and adults.

The findings have important implications for school reopenings, daycare centers, and other crowded settings where kids and teachers closely interact. In the news release, senior author Alessio Fasano, MD, said that children should not be discounted as potential transmitters of the virus.

"During this COVID-19 pandemic, we have mainly screened symptomatic subjects, so we have reached the erroneous conclusion that the vast majority of people infected are adults," he said. "However, our results show that kids are not protected against this virus."

This is particularly relevant for hard-hit low-income families, especially those in multigenerational households with vulnerable older adults. In the study, 51% of children infected with COVID-19 came from low-income communities, versus 2% from high-income neighborhoods.

To prevent further spread amid school reopenings this fall, the authors called for physical distancing, universal masking, strict handwashing protocols, routine screening of students, and a hybrid system of distance and in-person learning.