Antibodies in Infants Born to Mothers With COVID-19 Pneumonia

Tests for IgG and IgM antibodies for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) became available in February 2020. On March 4, 2020, the seventh edition of the New Coronavirus Pneumonia Prevention and Control Protocol for the novel coronavirus disease 2019 (COVID-19) was released by the National Health Commission of the People’s Republic of China and added serological diagnostic criteria. A previous study of 9 pregnant women and their infants found no maternal-infant transmission of SARS-CoV-2 based on reverse transcriptase-polymerase chain reaction (RT-PCR). We applied these new criteria to 6 pregnant women with confirmed COVID-19 and their infants because serologic criteria would allow more detailed investigation of infection in newborns.

Methods Clinical records and laboratory results were retrospectively reviewed for 6 pregnant women with COVID-19 admitted to Zhongnan Hospital of Wuhan University from February 16 to March 6, 2020, confirmed based on symptoms, chest computed tomography, and positive RT-PCR results.

Blood samples were collected from the mothers at delivery and neonatal blood and throat swab samples were collected at birth. Quantitative RT-PCR for SARS-CoV-2 nucleic acid (RT-PCR Kit, BioGerm) was conducted on neonatal serum and throat swabs. Inflammatory cytokines (CBA Human Th1/Th2 Cytokine Kit II, BD Biosciences) were tested on neonatal serum. Maternal and neonatal sera samples were used to test for IgG and IgM antibodies. All tests were performed by 2 researchers (Y.T. and Q.D.), with SARS-CoV-2 IgG and IgM samples from infants double checked (CLIA Laboratory testing followed guidance from the World Health Organization. The sensitivity and specificity reported by the manufacturer for IgG are 88.2% and 99.0% respectively, and for IgG are 97.8% and 97.9%.

This study was approved by the Zhongnan Hospital of Wuhan University institutional review board, which waived informed consent for this retrospective study.

Results All 6 mothers had mild clinical manifestations. All had cesarean deliveries in their third trimester in negative pressure isolation rooms. All mothers wore masks, and all medical staff wore protective suits and double masks. The infants were isolated from their mothers immediately after delivery.

All 6 infants had 1-minute Apgar scores of 8 to 9 and 5-minute Apgar scores of 9 to 10. Neonatal throat swabs and blood samples all had negative RT-PCR test results. All 6 infants had antibodies detected in their serum. Two infants had IgG and IgM concentrations higher than the normal level (<10 AU/mL). One infant had an IgG level of 125.5 and IgM level of 39.6 AU/mL; the second infant, had an IgG level of 113.91 AU/mL and IgM level of 16.25 AU/mL (Table 1). Their mothers also had elevated levels of IgG and IgM (Table 2). Three infants had elevated IgG levels (75.49, 73.19, 51.38 AU/mL) but normal IgM levels; all 3 mothers had elevated IgG

<table>
<thead>
<tr>
<th>Clinical value</th>
<th>Reference range</th>
<th>Infant*</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>IgM, AU/mL</td>
<td>&lt;10</td>
<td>39.6</td>
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<tr>
<td>IgG, AU/mL</td>
<td>&lt;10</td>
<td>125.5</td>
</tr>
<tr>
<td>IL-6, pg/mL</td>
<td>0.1-2.9</td>
<td>15.07</td>
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</tbody>
</table>

*Infants and mothers correspond by number between tables.
and 2 also had elevated IgM levels. Inflammatory cytokine IL-6 was significantly increased in all infants. None of the infants presented any symptoms as of March 8, 2020.

Discussion | Among 6 mothers with confirmed COVID-19, SARS-CoV-19 was not detected in the serum or throat swab by RT-PCR in any of their newborns. However, virus-specific antibodies were detected in neonatal blood sera samples. The IgG concentrations were elevated in 5 infants. IgG is passively transferred across the placenta from mother to fetus beginning at the end of the second trimester and reaches high levels at the time of birth. However, IgM, which was detected in 2 infants, is not usually transferred from mother to fetus because of its larger macromolecular structure. In a study of mothers with SARS, the placentas of 2 women who were convalescing from SARS-CoV infection in the third trimester of pregnancy had abnormal weights and pathology. Whether the placentas of women in this study were damaged and abnormal is unknown. Alternatively, IgM could have been produced by the infant if the virus crossed the placenta.

This study is limited by the small sample size, lack of cord blood, amniotic fluid, and breast milk and by incomplete information on the outcome of the infants. These findings are important for understanding the serological characteristics of infants whose mothers are infected with SARS-CoV-2 and further study is necessary.

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Published Online: March 26, 2020. doi:10.1001/jama.2020.4861

Author Contributions: Drs Long and Zhang had full access to all the data in the study and take responsibility for the integrity of the data and accuracy of the data analysis. Dr Zeng and Ms Xu contributed equally to the study.

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Critical revision of the manuscript for important intellectual content: Fang, Tang, Deng, Zhang.
Statistical analysis: Zeng, Xu, Fan, Tang, Deng.


Conflict of Interest Disclosures: None reported.

Funding/Support: This study was supported by grants 81272372 from the National Natural Science Foundation of China and zsyj2016033 from Zhongnan Hospital of Wuhan University Science, Technology, and Innovation Seed Fund.

Role of the Funder/Sponsor: The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.


Training and Fit Testing of Health Care Personnel for Reusable Elastomeric Half-Mask Respirators Compared With Disposable N95 Respirators

The demand for disposable respiratory protective devices needed to protect health care personnel may exceed supply during large outbreaks of respiratory infectious diseases. Concerns are growing over global shortages of respiratory protective devices during the novel coronavirus disease 2019 (COVID-19) pandemic.

Supplemental content

A reusable alternative to N95 respirators for which health care personnel can be rapidly assessed for fit (fit testing) and trained for use is needed. Elastomeric half-mask respirators (EHMRs), which provide the same level of respiratory protection as N95 respirators, are one alternative (eFigure in Supplement 1). These reusable respirators are used in construction and manufacturing, but not widely used in health care because of uncertainty about disinfection methods and upfront costs. The goal of this demonstration study was to test the feasibility of rapidly training and fit testing health care workers to EHMRs.