COVID-19 JOURNAL READING NEWBORN

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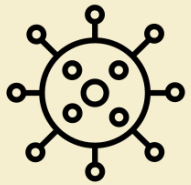
COVID-19



- The novel virus was named **SARS-CoV-2** and was identified as the agent of a new respiratory syndrome named **COVID-19**
- Clinical conditions ranging from asymptomatic viral shedding, to mild illness as common cold, to severe influenza-like illness and viral pneumonia
- Pediatric cases of COVID-19 are less severe than disease occurring among older individuals
- Children of all ages are susceptible to SARSCoV-2, and that **infants under 1 year of age are at risk for severe disease**

LIMITED data are available for **pregnant women** and **newborns** with **COVID-19**

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PERSPECTIVE

Perinatal aspects on the covid-19 pandemic: a practical resource for perinatal–neonatal specialists

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QUESTIONS

1. Is there a vertical transmission of SARS-CoV-2 during pregnancy, and if so, can this lead to abortions, premature labor, or congenital disease such as observed in CMV or Zika disease?
2. Is pregnancy a risk factor for severe COVID-19?
3. What are the dangers of SARS-CoV-2 infection in labor?
4. What are the dangers of SARS-CoV-2 infection in neonates?
5. Can SARS-CoV-2 be transmitted through human milk?

Current guidelines/expert experience

- United States Center for Diseases Control (CDC)
- American College of Obstetricians and Gynecologists (ACOG)
- Society for Maternal–Fetal Medicine (SMFM)
- United Kingdom National Health Services (NHS)
- Royal College of Obstetricians and Gynecologists (RCOG)
- Academy of Breastfeeding Medicine (ABM)
- National Institutes of Health (NIH)
- American Academy of Pediatrics (AAP)

Is there vertical transmission of SARS-CoV-2 during pregnancy?

1. **A retrospective review of nine Chinese pregnant women with laboratory-confirmed COVID-19 pneumonia**

   →Amniotic fluid, cord blood, and neonatal throat swabs all tested **NEGATIVE** for the virus

2. **Compared 16 pregnant women with COVID-19 to 45 women without COVID-19**

   → Only one of the 16 pregnant women with COVID-19 had a severe disease

   → 10 neonates in the COVID-19 group were tested by PCR and all **NEGATIVE**

3. **33 neonates of whom 3 were reported to have early onset COVID-19 infection**

   → Nasopharyngeal/anal swabs for RT-PCR were NOT obtained IMMEDIATELY after birth in any of the infants

   → Positivity of the test does not prove vertical transmission

☐ **Vertical transmission from maternal infection during the third trimester probably does not occur, or likely occurs very rarely**

Is pregnancy a risk factor for severe SARSCoV-2 infection?

- Pregnancy is a partially immunocompromised state
- No comparative data to determine whether pregnancy is a risk factor for severe SARS-CoV-2 pneumonia
- **The clinical characteristics of COVID-19 pneumonia in pregnant women were <u>similar</u> to those reported for non-pregnant adult patients**
- **Complications of pregnancy** such as diabetes, cardiac failure, or hypertension, which have been identified as risk factors for severe COVID-19 infections

☐ **Based on these scant data, we cannot conclude if pregnancy is a risk factor for more severe disease in women with COVID-19**

What are the dangers of COVID-19 infections in labor?

- The comparison of pregnancy outcomes between 16 women with COVID-19 and 45 women without COVID-19

  → No significant differences in fetal distress, meconium-stained amniotic fluid, preterm birth, and neonatal asphyxia

- Another study showed all nine infants born to COVID-19 infected pregnant mothers had normal 1- and 5-min Apgar scores

☐ **These two small studies, with limited clinical information do not provide an answer to our question**

What are the dangers of SARS-CoV-2 infections in neonates?

- A clinical retrospective analysis of 10 neonates born to 9 mothers with confirmed COVID-19 pneumonia:
  - 4 Full-term infants
  - 6 prematurity
  - 2 SGA
  - 1 LGA
  - 6 RDS
  - 2 Febrile
  - 2 Thrombocytopenia with abnormal liver function
  - 5 Discharge healthy
  - 1 Died

  → Test for SARS-CoV-2 were all **NEGATIVE**

  → **It is unclear if the complications noted were related to prematurity or to SARS-CoV-2**

  → The negative testing would suggest that the virus was unlikely to be the cause

- Studied showed the younger the child, the more severe the disease

☐ **We cannot define from these limited data the extent of disease severity in neonates**

Can SARS-CoV-2 be transmitted through human milk?

- Study of nine pregnant women with laboratory-confirmed COVID-19 pneumonia

  → All breast milk samples that were collected and tested after the first lactation were **NEGATIVE** for the virus

☐ **Insufficient sample size to make a definitive statement that SARS-CoV-2 is or is not excreted in human milk**

INITIAL GUIDANCE:

Management of Infants Born to Mothers with COVID-19

Date of Document: April 2, 2020

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Perinatal Medicine, and Committee on Infectious Diseases

Perinatal transmission and congenital infection

- **Vertical transmission (prenatal/congenital or perinatal)** of SARS-CoV-2 from infected pregnant women to their newborns is **uncertain**

- Two studies describe detection of SARS-CoV-2-specific IgM and IgG in a total of 3 newborns of infected women

  →**Trans-placental transfer** may have occurred resulting in fetal production of IgM antibody

- **False-positive IgM** results in other diseases limit the interpretation of these studies

  → Need for further studies to assess the potential for *in utero* transmission

Table 1. SARS-CoV-2 in Pregnant Women and Newborns and Molecular Testing Results

Ref. #	Tested Patients	Clinical Data	Tested specimens
4	6 women 6 infants	• Maternal symptom onset 1-7 days before delivery • Births at 36 0/7 – 39 4/7 weeks • All cesarean delivery • Two births at 36 weeks due to preterm labor • No maternal intubations or deaths • No neonatal illness	• Maternal throat swabs positive • Amniotic fluid and breast milk negative in all women • Neonatal cord blood and nasopharyngeal swabs negative
8	3 women 3 infants	• Maternal symptoms 1-15 days prior to delivery; tested positive 0-3 days prior to delivery • Births at 38 4/7 – 40 0/7 weeks • Cesarean delivery (2 cases); vaginal (1 cases) • Infants separated immediately after birth and bathed shortly thereafter • No maternal intubations or deaths; no neonatal illness	• Maternal positive tests from oropharyngeal swab; feces positive in one woman • Breast milk, vaginal mucus, and placenta negative • Neonatal oropharyngeal swab, urine, feces, whole blood and serum collected immediately after birth and all negative. • Neonatal oropharyngeal swabs negative Day 1
11	1 woman 1 infant	• Mother with symptoms 6 days prior to delivery • Intubated on day of delivery due to progressive illness, prior to delivery • Birth at 30 weeks gestation • Cesarean delivery due to non-reassuring fetal status • Infant separated at birth and fed formula • Mother recovered; newborn well	• Maternal sputum tested positive 2 days prior to delivery • Amniotic fluid and placental negative • Cord blood, newborn gastric aspirate and newborn throat swab negative at time of delivery • Newborn throat and stool swab negative Day 3 • Newborn throat swab negative Day 7 and Day 9
12	1 woman 1 infant	• Maternal symptoms 1 day prior to delivery • Cesarean delivery due to maternal condition • Mother wore N95 mask during delivery • Newborn separated at 10 minutes of age; fed formula • Infant with lymphopenia, elevated liver function tests	• Maternal pharyngeal swab positive 1 day postpartum • Placenta and breast milk negative • Cord blood negative • Newborn pharyngeal swab **positive** at 36 hours of age • Newborn pharyngeal and anal swabs negative by 15 days of age
21	7 women 7 infants	• Maternal symptoms 1-4 days before delivery (2 cases); day of delivery (2 cases); 1-3 days after delivery (3 cases)	• Maternal throat swab positive • Infant pharyngeal swabs on Day 1 (4); Day 3 (1); Day 7 (1); Day 9 (1) all negative

Continued…

		• Births at 33 6/7 – 39 0/7 weeks • Cesarean delivery in all cases • Fetal distress (5 cases) • ROM 5-7 hours prior to delivery (2 cases) • 6/7 infants with respiratory or gastrointestinal symptoms; 1/6 infants died	
16	3 women 3 infants	• Details reported for 3/33 positive mothers whose infants had positive tests • Mothers with positive tests 0-3 days prior to delivery • Births at 40 0/7, 40 4/7 and 31 2/7 weeks • Delivery by cesarean section • ROM prior to delivery in 1 (possibly 2) cases • Separation at birth • Two term infants developed fever and instability 1-2 days after delivery; both diagnosed with pneumonia and recovered • Preterm infant unstable from birth	• Nasopharyngeal and anal swabs **positive** on days 2 and 4; all negative by day 6

- **Vertical transmission from maternal infection during the third trimester probably does not occur, or likely occurs very rarely**

Neonatal management recommendations

1. Neonates born to women with COVID-19

&

2. Neonates born to women with testing for COVID-19 pending at the time of delivery

→ **Persons under investigation (PUIs)** for infection

Personal protective equipment and isolation precautions

- **High-risk exposure** to a person with COVID-19 disease
  - Direct physical contact
  - Close (<6 feet) contact for a prolonged period of time

- Using aerosolizing equipment demonstrates that the virus can remain in the air for up to 3 hours

Personal protective equipment and isolation precautions

- **Droplet and Contact Precautions**: gown, gloves, standard procedural mask and eye protection (either face shield or goggles) should be used with infants born to mothers with COVID-19 *(Personal eyeglasses are not adequate protection)*

- **Airborne, Contact and Droplet Precautions:** gown, gloves, N95 respiratory mask with eye protection, **OR** air-purifying respirator should be used when patients require bag-mask ventilation, intubation, tracheal suctioning, nasal cannula oxygen > 2 L/min, continuous positive airway pressure and/or positive pressure ventilation of any type

Delivery room management of neonates

- Neonatal clinicians should attend deliveries based on their normal center-specific policies; **maternal COVID-19 alone is not an indication to do so**

- If neonatal clinicians are needed to perform infant stabilization, the responding clinicians should use **Airborne, Droplet, and Contact Precautions-level PPE**

  →Maternal virus aerosols and the potential need to intubate, perform airway suctioning, and initiate positive pressure ventilation may generate infant aerosols

Maternal and newborn separation

- **Temporary separation** of mother and newborn will minimize the risk of postnatal infant infection from maternal respiratory secretions
- The benefits of separation may be greater in mothers with more serious illness
- The likely benefits of temporary maternal and newborn separation at birth for decreasing the risk of newborn infection should be discussed with the mother, optimally prior to delivery

Newborn admission after maternal separation

- Infants born at (or near) term by maternal COVID-19 who are well-appearing at birth may be admitted to **specific areas physically separate from newborns unaffected**
- Newborns should be **bathed as soon as possible** after birth to remove virus potentially present on skin surfaces
- Clinical staff should use **Droplet and Contact Precautions** until newborn virologic status is known to be negative by SARS-CoV-2 PCR testing

Newborn admission after maternal separation

- Infants born requiring neonatal intensive care optimally should be admitted to a single patient room with **negative room pressure** (or other air filtration systems)

- If this is not available, infants should be maintained at least **6 feet (~2 m) apart** and/or placed in air temperature-controlled incubator

- **Airborne, Droplet, and Contact Precautions** and **negative room pressure** should be used for the care of infants requiring CPAP or any form of mechanical ventilation

Breast milk feeding

- No study to date has demonstrated the presence of SARS-CoV-2 in breast milk
- Mothers may **express breast milk** (after appropriate breast and hand hygiene) and this milk may **be fed to the infant by designated caregivers**
- Breast pumps should be cleaned thoroughly
- In addition to the known benefits of breastfeeding, mothers' milk may provide infant protective factors after maternal COVID-19

Alternative well newborn care

- If the mother chooses to room-in with her infant rather than be separated; or if the center does not have the capability of caring for the infant in a separate area, the infant should remain **at least 6 feet from mother** at all times

- Placing the infant in an **air temperature-controlled incubator** may afford greater infant protection

- If the mother also requests skin-to-skin contact with her infant, including direct breastfeeding, she should comply with strict preventive precautions, including the **use of mask** and meticulous **breast and hand hygiene**

Newborn viral testing

- The optimal timing and extent of testing is currently unknown
- The following procedures are currently recommended:

1. Molecular assay testing should be done **first at ~24 hours of age**
2. Repeat testing should be done **~48 hours of age**
3. At each test, consider using one swab samples first the **throat** and then the **nasopharynx**
4. May consider additional **rectal swab** testing if available at their center (particularly for sick infants requiring prolonged hospital care)

- Infants who are **positive** on initial PCR testing, follow-up testing should be done at **48-72 hour intervals** until **two consecutive negative** tests

Newborn birth hospital discharge

- Well newborns should receive all indicated care and be discharged from the birth hospital based on the center's normal criteria

1. Infants determined to be **infected** by molecular testing, but with **no symptoms** of COVID-19, may be **discharged home** with appropriate precautions and plans for frequent outpatient follow-up contacts through 14 days after birth

   (Uninfected individuals >60 years of age and those with comorbid conditions should NOT provide care if possible)

2. Infants with **negative** SARS-CoV-2 molecular testing should optimally be **discharged** to the care of a designated healthy (**non-infected**) caregiver

Newborn birth hospital discharge

- If the mother is in the same household, she should maintain a **distance of at least 6 feet away** as possible, and when in closer proximity to the neonate should use a **mask and hand hygiene** until EITHER

a) She has been **afebrile for 72 hours without use of antipyretics**, *AND*

b) At least 7 days have passed since symptoms first appeared; *OR*

She has **negative results** of a molecular assay for **at least two consecutive** nasopharyngeal swab specimens collected **≥24 hours apart**

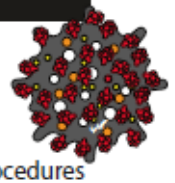
Maternal visitation for infants requiring ongoing hospital care

- Mothers with COVID-19 should **NOT** visit infants requiring **neonatal intensive care** until they meet ALL the requirements outlined below:

1. **Resolution of fever** without the use of antipyretics for **at least 72 hours**
   AND
2. **Improvement** (but not full resolution) in respiratory **symptoms**
   AND
3. **Negative results** of a molecular assay for at least **two consecutive** nasopharyngeal swab specimens collected **≥24 hours apart**

SUSPECTED OR CONFIRMED COVID-19 DURING PREGNANCY: MATERNAL CLINICAL FEATURES, DELIVERY ROOM PRECAUTIONS AND NEONATAL MANAGEMENT

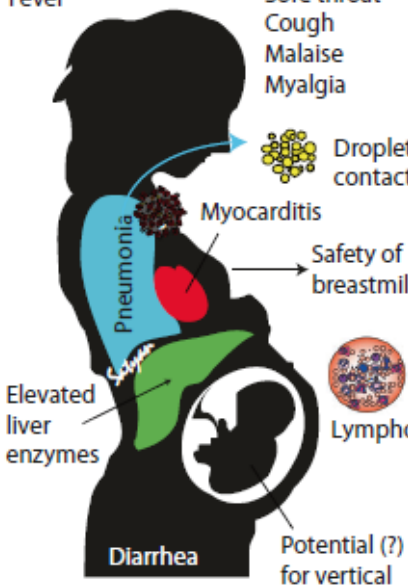
Specially prepared delivery room or operating room preferably with negative pressure
Obstetric and neonatal providers with full PPE
Droplet and contact precautions: Gown, glove, mask and eye shield
Neonatal resuscitation as per current guidelines
Airborne precautions - especially with suction, intubation, CPAP and other aerosol generating procedures



MATERNAL INFLUENZA LIKE ILLNESS

Fever

Sore throat
Cough
Malaise
Myalgia



Droplet and contact spread

Myocarditis

Elevated liver enzymes

POTENTIAL CLINICAL FEATURES IN COVID-19 POSITIVE PREGNANT WOMAN (WIDE RANGE)

POSSIBLE MODES OF TRANSMISSION

SARS-CoV-2

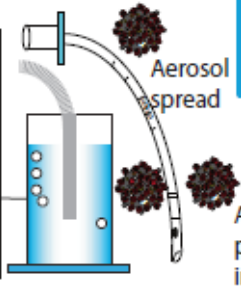
Potential for postnatal infection

Safety of breastmilk (?)

Lymphopenia

Potential (?) for vertical transmission

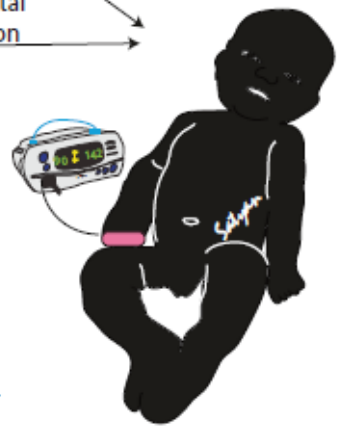
Aerosol generating procedures:
Suction
Intubation
Extubation
HFNC
N-CPAP



Aerosol spread

Airborne & contact precautions - PPE including eye shield and N 95 mask or PAPR, gown and gloves for delivery room personnel

Expressed breastmilk using a dedicated pump after strict hand hygiene



NEONATES - MOSTLY ASYMPTOMATIC

(non-specific symptoms such as temperature instability, apnea, respiratory distress, GI symptoms, hypotension are possible)

NEONATAL MANAGEMENT

Consider temporarily separating the infant from the mother;

Healthy caregiver may feed expressed breast milk;

If mother and infant are not separated, breastfeeding while wearing a mask and after hand hygiene may be considered;

Nasopharyngeal / throat and rectal (optional) swabs for RT-PCR at 24 h and repeat X 1 at 48 h;

Isolation pending test results;

NEWBORN DISCHARGE - as per clinical status; transmission precautions at home based on infant's test results

Journal of Perinatology

DELIVERY MODE:

Dictated by usual obstetric practice

ALGORITHM FOR MANAGEMENT OF PUI WITH SUSPECTED SARS-CoV-2 INFECTION

Suspected pregnant mother with "influenza like illness" - Persons under investigation (PUI)

↓

Nasopharyngeal and oropharyngeal swabs for SARS-CoV-2 RT-PCR and other respiratory viruses (e.g., influenza)

SARS-CoV-2 positive

SARS-CoV-2 negative

Care as per maternal and neonatal status

Severe COVID-19 with pneumonia and/or ARDS

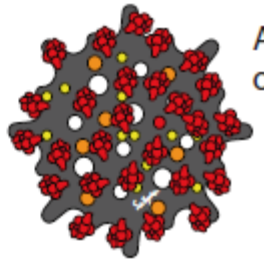
Intensive care support

Asymptomatic or mild URI

Mask for source containment

Uninfected individuals > 60 y or with comorbidities should not provide care - if possible

NICU support



Symptomatic

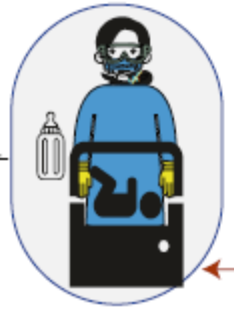
SARS-CoV-2 positive

Asymptomatic

Discharge with close follow-up

Neonatal providers performing stabilization - airborne precautions

Neonatal team to "standby" to conserve PPE



Temporary separation from mother (esp. severe illness)

SARS-CoV-2 negative and asymptomatic

Care by a healthy caretaker (isolation or transmission precautions until the mother is afebrile, improvement of symptoms and 2 negative tests > 24 h apart)

Delivery - airborne precautions
Resucitation as per NRP guidelines
Separation of baby

Neonatal providers to attend deliveries only if clinically indicated

Take home message

1. Vertical transmission from maternal infection during the third trimester **probably does not occur**, or likely occurs very **rarely**
2. **Droplet and Contact Precautions** for infants born to mothers with COVID-19
3. **Airborne, Contact and Droplet Precautions for** patients require intubation, tracheal suctioning, and/or positive pressure ventilation of any type
4. **Temporary separation** of mother and newborn or maintain a **distance of at least 6 feet away** will minimize the risk of postnatal infant infection
5. Newborns should be **bathed as soon as possible** after birth to remove virus potentially present on skin surfaces

Take home message

6. Mothers may **express breast milk** and this milk may **be fed to the infant by designated caregivers**
7. Molecular assay testing should be done **first at ~24 hours of age and repeat ~48 hours of age**
8. Infants who are **positive** on initial PCR testing, follow-up testing should be done at **48-72 hour intervals** until **two consecutive negative** tests
9. Mothers with COVID-19 should **NOT** visit infants requiring **neonatal intensive care** until:
   a) **Resolution of fever** for **at least 72 hours**
   b) **Improvement** in respiratory **symptoms**
   c) **Negative results** of a molecular assay for at least **two consecutive** nasopharyngeal swab specimens collected **≥24 hours apart**

Thanks for listening