Pregnancy during the COVID Pandemic

University of Toronto OBGYN QIPS COVID-19 in Pregnancy Webinar

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How does this apply to the pregnant population?
Coronavirus in Pregnancy

15-20% of COVID + are Reproductive Age Women

1. No difference in rate of infection in aged-match pregnant women
2. No difference in the symptom profile *temperature and cough most common
3. No difference in the spectrum of disease: 80-85% mild COVID infection
4. Same risk factors for moderate-severe disease: BMI, diabetes, hypertension, cardiac Dx
Fetal effects of COVID infection in pregnancy

• Reports of infection across all GA
  - majority of report > 34w

• Too early in experience to comment on:
  a. teratogenicity
  b. disruption of organ development &/or function
  c. fetal growth
  d. fetal wellbeing

**IMPACT**

- Maternal respiratory illness
- Maternal infection
- Maternal critical illness
- Direct viral effect
- Hypoxemia
- Inflammation
- MSOF

ACE-2 found at human maternal-fetal interface & fetal organs
Obstetrical effects of COVID infection in pregnancy

n= 33 studies with 385 pregnancies reported

• All deliveries were women with active infection

• Range of GA at birth: 30-41w

• 15.2% Preterm birth: Indicated by maternal status
  Spontaneous
  Indicated by fetal status

• 7.8% Low birth weight

• 69.4% C/Section 30.6% Vaginal birth

• 3 reported cases of IUFD (associated co-morbidity)

252 births
124 ongoing pregnancies
9 T1 loss (ectopic, SA, TA)
Maternal effects of COVID infection in pregnancy

1. Mild Cases
   The clinical symptoms are mild and no pneumonia manifestations can be found in imaging.

2. Moderate Cases
   Patients have symptoms such as fever and respiratory tract symptoms, etc. and pneumonia manifestations can be seen in imaging.

3. Severe Cases
   Adults who meet any of the following criteria: respiratory rate ≥ 30 breaths/min; oxygen saturation ≤ 93% at a rest state; arterial partial pressure of oxygen (PaO₂)/oxygen concentration (FiO₂) ≤ 300 mmHg. Patients with > 50% lesions progression within 24 to 48 hours in lung imaging should be treated as severe cases.

4. Critical Cases
   Meeting any of the following criteria: occurrence of respiratory failure requiring mechanical ventilation; presence of shock; other organ failure that requires monitoring and treatment in the ICU.
   Critical cases are further divided into early, middle and late stages according to the oxygenation index and compliance of respiratory system.
   - **Early stage**: 100 mmHg < oxygenation index ≤ 150 mmHg; compliance of respiratory system ≥ 30 mL / cmH₂O; without organ failure other than the lungs. The patient has a great chance of recovery through active antiviral, anti-cytokine storm, and supportive treatment.
   - **Middle stage**: 60 mmHg < oxygenation index ≤ 100 mmHg; 30 mL/cmH₂O > compliance of respiratory system ≥ 15 mL/cmH₂O; may be complicated by other mild or moderate dysfunction of other organs.
   - **Late stage**: oxygenation index ≤ 60 mmHg; compliance of respiratory system < 15 mL/cmH₂O; diffuse consolidation of both lungs that requires the use of ECMO; or failure of other vital organs. The mortality risk is significantly increased.

Upper respiratory infection
* Most common

Pneumonia
* Link to pre-existing co-morbidity

Increasing signs of respiratory distress

Respiratory Failure
Septic Shock
MSOF
Moderate & Severe COVID infection in pregnancy

Cardiomyopathy
Viral induced
- global hypokinesis
- decreased L ejection fraction

Pre-eclampsia
2 cases
“Mimic” or Co-morbidity

Transaminitis
↑ LDH
Thrombopenia
↑ CR

Overlapping symptoms
Use: PCR, Urate +/- PLGF

Coagulopathy
2 cases
↑ d-dimer
↓ fibrinogen
↑ PTT
- Sepsis activation of coagulation & fibrinolytic cascades
- Effect: thrombotic or hemorrhagic
- No report of PE

Mortality
2 cases
Attributed to ARDS
? Developing country impact
+ Social media reports

COVID

Obstetrics & Gynaecology
UNIVERSITY OF TORONTO
COVID-19 binds to type II pneumocyte

Uses cellular machinery to replicate

Ruptures host cell and releases virus to the alveolus

• Immune response triggered
• Virus attacks neighboring type II cells
• Virus present in respiratory droplets/secretions

Fluid accumulates in alveolus
• dilutes surfactant

Decrease Gas exchange & Increase WOB

Neutrophils destroy infected cells

Pneumocyte trauma/loss

ARDS

Inflammation spreads to bloodstream: SIRS

MSOF
COVID Pneumonia in pregnancy

- Less lung volume
- Increased secretions
- Increased minute ventilation
- Increased O2 consumption

* Altered cellular immunity

Predispose to maternal deterioration

Reported Cases:
4% admitted to ICU
1.6% mech ventilation
1 case ECMO

<table>
<thead>
<tr>
<th>Arterial blood gas measurement</th>
<th>1st trimester</th>
<th>3rd trimester</th>
<th>Nonpregnant</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.42–7.46</td>
<td>7.43</td>
<td>7.4</td>
</tr>
<tr>
<td>PaO2 (mm Hg)</td>
<td>105–106</td>
<td>101–106</td>
<td>93</td>
</tr>
<tr>
<td>PaCO2 (mm Hg)</td>
<td>28–29</td>
<td>26–30</td>
<td>37</td>
</tr>
<tr>
<td>Serum HCO3 (mEq/L)</td>
<td>18</td>
<td>17</td>
<td>23</td>
</tr>
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</table>
COVID Pneumonia management in pregnancy

Start oxygen therapy if O2 sat < 94%
Patient in prone position
Avoid nebulized treatments

**Oxygen delivery:**
- Nasal Cannula (regular): 1-6 L/min
- High Flow Nasal Cannula: 50-60 L/min
- Non invasive positive pressure: **AGMP therefore not used**
- Endotracheal Intubation

**Fluid management:**
- Conservative strategy associated with decreased duration of mech vent
- Aim: negative daily balance 0.5-1.0L
- Encourage PO fluid; TKVO
- Avoid maintenance fluid
- If positive balance & resp symptoms: consider furosemide Rx

**Antibiotics:**
- NO INDICATION
- if suspect CAP: azithromycin and ceftriaxone

**Anti viral / Immune modulator:**
- No indication
- Research ONLY

Include RT / Anesthesia for airway management.
Management of pregnancy with COVID infection

MILD disease: DOES NOT require hospitalization
- self-isolation at home
- supportive therapy: acetaminophen, hydration
- education: warning signs
- medical / obstetrical visits as necessary: use of PPE & isolated clinic space
- post recovery: not infectious
  follow up for fetal growth/ well being
  no special precautions for delivery

Indications for hospitalization:
- Shortness of breath (unable to walk across room, speak full sentence)
- Cough with blood
- Chest pain
- S/S dehydration
- Decreased level of consciousness
- Oxygen saturation < 94%
- CXR consistent with pneumonia (ground glass opacities)

Regardless of GA

Illness assessment
Consideration of co-morbidity
Surveillance & warning signs

- **Vitals with O2 saturation q4h**: If requiring oxygen support increase vitals to q hourly with 1:1 RN care

If requires:
- New use of oxygen support
- RR increases despite normal O2 saturation
- Increasing amount of oxygen to maintain saturation >94%

**Warning signs of ACUTE maternal deterioration:**
- Increased O2 demands by 50% over 1-2h
- O2 sat < 94% despite O2 support
- >4.0L O2 by facemask

**MEOWS: Maternal Early Obstetrical Warning Score**

<table>
<thead>
<tr>
<th>Physiological parameters</th>
<th>Normal values</th>
<th>Yellow alert</th>
<th>Red Alert</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respirator rate</td>
<td>10-20 breaths per minute</td>
<td>21-30 breaths per minute</td>
<td>&lt; 10 or &gt;30 breaths per minute</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>96-100%</td>
<td></td>
<td>&lt; 95 %</td>
</tr>
<tr>
<td>Temperature</td>
<td>36.0-37.4°C</td>
<td>35-36 or 37.5-38°C</td>
<td>&lt; 35 or &gt; 38°C</td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>100-139 mmHg</td>
<td>150 - 180 or 90 – 100 mmHg</td>
<td>&gt;180 or &lt; 90 mmHg</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td>50-89 mmHg</td>
<td>90–100 mmHg</td>
<td>&gt;100 mmHg</td>
</tr>
<tr>
<td>Heart rate</td>
<td>50-99 beats per minute</td>
<td>100-120 or 40-50 beats per minute</td>
<td>&gt;120 or &lt; 40 beats per minute</td>
</tr>
<tr>
<td>Neurological response</td>
<td>Alert</td>
<td>Voice</td>
<td>Unresponsive, pain</td>
</tr>
</tbody>
</table>

Based on unique pregnancy physiology

**ANY DETERIORATION**

2 yellow or 1 red alert triggers MD evaluation
Principles for location of care

Location depends on the local facility:
Antenatal ward or L&D in level III centre
Medicine ward in community setting

If patient is admitted to ICU:
May consider transfer

a. PREVIABLE gestation:
   DOES NOT require transfer for OB reasons
   May require transfer for MED reasons

a. PRETERM VIABLE gestation & referral facility DOES NOT have neonatal facilities:
   CONSIDERATION could be made for transfer given the inherent PTB risk
   May require transfer for MED reasons
Preterm Delivery Considerations

- COVID-19 infection is **NOT a direct indication for delivery**
- Decision to deliver is **individualized** based on maternal & fetal status, GA

**General principle of critical care in pregnancy:**
- Delivery will not improve maternal status
- Delivery MAY trigger deterioration

**Questions:**
1. Would delivery improve maternal vent status
2. Is there evidence of abnormal fetal status
3. Which is greater:
   - risk of prematurity
   - risk of intrauterine fetal demise
4. What level of fetal surveillance
   - none
   - NST / EFM
5. What abnormal surveillance to act on

**Suggested indications for delivery with severe COVID:**
- Intrauterine infection
- DIC
- Hepatic or renal failure
- Compromised CV function due to gravid uterus
- Compartment syndrome
- Maximum vent settings, ARDS
- Cardiac arrest
- Fetal demise
- GA of low morbidity / mortality
Antenatal considerations

Role for thromboprophylaxis:

- Any pregnant patient admitted to hospital for any indication is at risk for VTE
- In GIM population, use of enoxaparin decreased mortality in patients with COVID severe illness

Recommend: VTE prophylaxis for pregnant patients admitted with moderate to severe disease COVID
- duration depends on clinical scenario

Role for Celestone:

Corticosteroid Guidance for Pregnancy during COVID-19 Pandemic

Key Points
- Corticosteroid use is an important part of prematurity treatment because it provides benefit to the fetus.
- Corticosteroid use may be related with increased morbidity and mortality in novel coronavirus disease 2019 (COVID-19).
- Therefore, during the COVID-19 pandemic, an alteration in current corticosteroid practices is necessary to uniquely weigh the maternal risks and fetal benefits.

Recommend: Use of celestone if risk of PTB

- lowest quality of evidence... authors opinion...
- leap from high dose/duration in ICU patient
Role of NSAIDS

• NSAID use was suggested to worsen COVID illness
• Insufficient scientific evidence to routinely avoid NSAIDs in patients with COVID-19 (Health Canada)

ASA for PET prophylaxis/based on abnormal placentation:
- review the renal parameters (lytes and CR)
- if no evidence of impairment likely continue risk PET > risk of ASA
- if impaired, suspending ASA until recovery will likely no have a dramatic effect on PET/IUGR risk

Indomethacin for Tocolysis:
- Given that no one tocolytic has proven benefit over another ..
- May consider alternative choice, use clinical judgment
Intrapartum recommendations

- Regardless of GA and disease severity: **Recommend hospital birth**
- Regardless of GA: **CEFМ based** on case reports of fetal compromise in women with COVID-19 diagnosis (8/18 – 44% incidence)
- **Maternal vital signs q 1-2h (HR, BP, RR, O2 sat)** Oxygen to keep O2 sat >94%
- **Hourly fluid status** to avoid fluid overload
- **No hydrotherapy** (risk of virus in feces? Infectious)
- **Encourage epidural anesthesia**: minimize risk for GA
- Limit # providers, vaginal exams
- **Fetal Scalp Electrode and Scalp lactate sampling** as per OB indications
- **Exclude Nitrous oxide** for pain management (potential aerosolization)
- **Emergent C/S for OB indications** not because of COVID diagnosis
- **Elective C/S should not be delayed** based on COVID diagnosis unless need for maternal stabilization.
- COVID diagnosis is **not an indication for IOL**; No delay an indication/urgent IOL unless need for maternal stabilization.
- **Second stage management**: Passive descent
  
  If SOB, maternal exhaustion or increasing hypoxia: may use assisted vaginal birth to shorten the second stage
- **Support delayed cord clamping** (especially in PTB)
- For PPH, **restricted use of Hemabate** (PGF2α): risk of bronchoconstriction
Patient driven stem cell collection

What is your status at this point in time?
Inception is operating as an Essential Workplace under the designation of the Ontario Government. Inception continues to receive collected cord blood from all hospitals nationally, including sites where CBS and Hema Quebec typically collect for their donation programs.

Inception is following Health Canada guidelines that advise adopting a “precautionary approach” with regards to donor screening and as such we are introducing additional measures to identify patients who have been in contact with COVID-19 through our Risk Assessment Questionnaire. For every cord blood unit stored we also store an aliquot for future maternal blood testing in the event this is required by Health Canada at the time of a release.

There have been suggestions that collections occur outside of patient rooms - unclear as to why.
There is no plan to transition cord blood collections to outside of the patient room. Given the advice above from Health Canada, we are advising hospitals to maintain their normal processes with regards to cord blood collection. In terms of kit pick up, we are working closely with partner hospitals, given individual site restrictions, to ensure the kits are able to exit the hospital.

At the patient discretion
Take sample for maternal COVID testing
Routine practice for collection

As per Inception™
Postpartum considerations

COVID Care:
- Supportive care: oxygen, anti-pyrexia medication
- No relapse of symptoms was found after delivery
- Mild disease: no indication for extended PP stay: DC based on maternal & fetal status

Thromboprophylaxis:
- For mild disease: based on OB indications (SOGC 2014 guideline)
- Moderate to severe COVID disease: based on OB indication
  if no OB indication: duration of hospitalization

NSAID for postpartum pain management:
- May consider alternative choice(s)
1. Provision of routine OB care:
   - key visits in person
   - use of virtual visits
   - “drive through” OB care
   - pre-screening: prior to clinic, at clinic entry
   - masking patient
   - restricting support partner

2. Elective Delivery:
   - no advantage to limit access to elective C/S
   - limit IOL to medical /obstetrical indication
   - ARRIVE trial: prolong hospital exposure, ? Risk

3. Early Post Partum Discharge Programs (ERAS)
   - low risk VB, ERCS
   - healthy mother baby dyad
   - organize for newborn screen & bilirubin > 24h
   - virtual OB follow up
4. Limit Access to “Increased Risk Procedures”:
   * increased response time for a category one C/S
   * decreased access to anesthesia support

   - Vaginal breech delivery
   - TOLAC
   - Trial of labor with vulnerable fetus: IUGR, aneuploidy
   - Unmedicated labor

5. Management of PPROM
   - consideration of IOL if > 34w GA
   - consideration for outpatient surveillance
Fever in labor: ? Does this this patient a have COVID infection

Temperature >37.8°C
Give 500 cc fluid bolus (takes 30 min). DO NOT GIVE ACETOMINOPHEN DURING THIS TIME
Repeat temperature 30 min after bolus completed
If still >37.8 (or any other symptoms) ….

Patient is now a PUI
NP swab for COVID
Initiate Droplet /Contact Precautions

- IF > 38°C … initiate chorioamnionitis workup and treatment … Blood cultures, Acetominophen, Broad spectrum ABX
- After birth- Neonate also a PUI: perform NP swab

** Note: if using Misoprostil use for term IOL:
- 25-50 µg dose for IOL will not give maternal temperature

** Same action plan for Post partum fever
Termination pregnancy during COVID Pandemic

Patient is screened on admission (symptoms & maternal temperature)

Screen negative (asymptomatic).. Proceed with IOL

1st dose of misoprostil with Tylenol (1g) po

Dose misoprostil q 4h
Dose Tylenol q6h (standing)

If temp > 37.8oC:
Bolus 500cc over 30 min
Recheck temp 30 min after bolus complete
If remains >37.8oC… patient is now a PUI

NP swab & Droplet/Contact Precautions

Screen positive (symptomatic).. Patient is a PUI

NP Swab & Droplet / Contact Precaution

1st dose of misoprostil + Tylenol (1g) po

Dose misoprostil q 4h
Dose Tylenol q6h (standing, regardless of maternal temp)

• Pretreat 24-36h with mifepristone (significant decrease IOL time)
• Can substitute ASA (325mg) if allergy
Recognizing the unique aspects of COVID infection & Pregnancy:

? How can we identify a COVID positive patient

? How do we evaluate a COVID positive patient & decide on disposition & management

? How do we protect the Health Care Provider and Environment