# **COVID in Pregnancy: What have we learned?**

Wendy L. Whittle MD PhD FRCSC Maternal Fetal Medicine Medical Director: Labor and Delivery & Antenatal Inpatient Care Sinai Health System; Toronto CA



Living document: April 22, 2021



Ernesto Antonio Figueiro-Filho\*, Mark Yudin and Dan Farine COVID-19 during pregnancy: an overview of maternal characteristics, clinical symptoms, maternal and neonatal outcomes of 10,996 cases described in 15 countries





- Hyperlinks to 667 papers
- 87 687 cases of COVID in pregnancy reported

- 96 Systematic reviews
- Reviews of M&M reports from the CDC

• National & International COVID & Pregnancy data registries

- "Living" Systematic Review: PregCOV-19
- Regularly updated key evidence & relevant management
- BMJ publication most recent March 2021

### World wide status of COVID: April 21st



#### World wide status of COVID:



<sup>(</sup>Source: Johns Hopkins University CSSE COVID-19 Data)

### Wave #3 COVID in Ontario:



### **Incidence of COVID in Pregnancy in Canada**

March 2020 – March 29, 2021



**1.16%** (0.67-1.59)

Pregnant population COVID +

**25.2%** (9-42.6)

**Reproductive age population COVID +** 

\*\*\* 1% of pregnant population (UK)

**\*\*\* 10%** Pregnant population admitted for any indication (US)

- Pregnancy NOT a risk factor for acquiring COVID
- Safety measures are effective @ protecting pregnant patients





### ? How does COVID present in the pregnant patient



MMWR Sept 2020 Khahil et al; EClinical Medicine (2020) Figueiro et al, J Perinat Med (2020) University of Birmingham LSR (Sept 2020)

### **Maternal effects of COVID**



University of Birmingham LSR (Sept 2020)

#### **Confirmed hospitalized for COVID indication**

#### **Reproductive Age Peer**







Ernesto Antonio Figueiro-Filho\*, Mark Yudin and Dan Farine

#### COVID-19 during pregnancy: an overview of maternal characteristics, clinical symptoms, maternal and neonatal outcomes of 10,996 cases described in 15 countries

SARS-CoV-2 infection in pregnancy: A systematic review and metaanalysis of clinical features and pregnancy outcomes

Asma Khalil<sup>a,b,\*</sup>, Erkan Kalafat<sup>a,c</sup>, Can Benlioglu<sup>a</sup>, Pat O'Brien<sup>d,e</sup>, Edward Morris<sup>d,f</sup>, Tim Draycott<sup>d,g</sup>, Shakila Thangaratinam<sup>h</sup>, Kirsty Le Doare<sup>i</sup>, Paul Heath<sup>i</sup>, Shamez Ladhani<sup>j,k</sup>, Peter von Dadelszen<sup>l</sup>, Laura A. Magee<sup>l</sup> 17 studies 2567 cases International

8 studies

10 996 cases

International

1. Most pregnant women have mild disease, make full recovery with no residual impact

2. Overall maternal morbidity risk "low" ICU admission 1-7%

ICU admission 1-7% Mechanical ventilation 1-4% Maternal death 1% Associated with pre-existing:

- medical co-morbidity
- BAME
- T3

3. Increased rates of hospitalization, ICU admission & mechanical ventilation compared with peers

### Incidence of COVID in pregnancy in Canada: now as of April 19, 2021



Increased by 400 cases in 19 days

- Reporting bias (delay)
- Added cases from BC (wave#3)
- Reflects uptick in cases

- ? Is this Wave #3 different for pregnant individuals
- ? What is the impact of VOC on the risk of infection in pregnancy
- ? What is the impact of VOC on maternal disease
- ? What is the impact of VOC on pregnancy outcome

	Symptomatic pregnant women (n=2,642) N (%)	Admitted for COVID Admitted for OB indication
Oxygen saturation measured on admission	2,392 (90.5)	
Oxygen saturation <95%	190 (13.5)	
Oxygen saturation ≥95%	1,223 (86.5)	Majority did not have
Missing	979	
Evidence of pneumonia on imaging	612 (23.2)	respiratory
Required respiratory support	475 (18.0)	compromise
Non-invasive oxygen (nasal canulae, mask or non- rebreathe mask)	339 (12.8)	
CPAP	44 (1.7)	BUT
Invasive ventilation or ECMO	71 (2.7)	
Required support but level not known	21 (0.8)	
Critical care received	250 (9.5)	
Maternal death	15 (0.6)	

UK®SS



## **UK**SS

#### **Compared with Wave #1:**



#### ICU Admissions

#### More symptomatic patients More moderate to disease



#### **Increased rate of critical illness**

### Incidence of COVID in pregnancy in Canada: now as of April 19, 2021



- ? Is this Wave #3 different for pregnant individuals YES
- ? What is the impact of VOC on the risk of infection in pregnancy Suspect increased # of COVID infections
- ? What is the impact of VOC on maternal disease Suspect increased symptomatic profile Suspect increased proportion of moderate-severe illness
- ? What is the impact of VOC on pregnancy outcome

### **Obstetrical impact of COVID in pregnancy**

- No reports of increase in rate of common OB complications: PET, BP, GDM, APH .....
- Increased C/S rate

- associated with: increasing severity of Dx leading to maternal/fetal compromise OB indications

• Increased rate of Low Birth Weight

Systematic review with meta-analysis: International data

**10 000** Pregnant patients (COVID + and COVID -)

**Compared with COVID – pregnant patients:** 



UKOSS (2021) Jafari et al (2020) Can COVID Feb 2021 Khahil et al; EClinical Medicine (2020) Figueiro et al, J Perinat Med (2020) RCOG Guideline (Oct 2020)

#### CANADIAN SURVEILLANCE OF COVID-19 IN PREGNANCY: EPIDEMIOLOGY, MATERNAL AND INFANT OUTCOMES

#### Infant outcomes from March 1, 2020 until December 31, 2020 in BC, AB, ON, and QC<sup>1</sup>

	n	Denominator	Percent
Apgar (5 minutes)			
<7	11	471	2.3
≥7	460	471	97.7
Birth weight (g)			
Low (<2500 g)	59	560	10.5
Normal (2500-4000 g)	460	560	82.1

Increased from 6% in general pregnant population in Canada



### **Obstetrical impact of COVID in pregnancy**

- Increased rate of Preterm Birth : International rate ~17-20%
  - Canada 12% increase from 7.8%



Majority of PTB occurring in T3- mean GA 34-35w: low risk of neonatal morbidity

UKOSS (2021) Jafari et al (2020) Can COVID Feb 2021 Khahil et al; EClinical Medicine (2020) Figueiro et al, J Perinat Med (2020) RCOG Guideline (Oct 2020)

U	K	9	S	S
	• •			

Wave #1 & 2 Wave #1 Pregnancy outcomes Symptomatic women Symptomatic women Asymptomatic women (n=2,642) admitted Mar-Nov 20 (n=2,837) N (%) N (%) (n=1,437) N (%) 2531 (91.4) Birth 1926 (72.4) 1260 (87.5) Ongoing pregnancy 663 (25.1) 148 (10.3) 239 (8.4) 53 (2.1) 29 (2.0) 67 (2.4) Pregnancy loss Gestation at end of pregnancy (weeks) <22 43 (2.2) 25 (1.9) 46 (1.8) 22-36 237 (18.4) 262 (10.1) 419 (21.2) 37 or more 1501 (76.5) 1,018 (79.5) 2262 (88.0) Missing 16 9 28

d Preterm birth 2 associated with severity of disease

Preterm birth rate did not change in wave #2

> UKOSS (2021) Jafari et al (2020) Can COVID Feb 2021 Khahil et al; EClinical Medicine (2020) Figueiro et al, J Perinat Med (2020) RCOG Guideline (Oct 2020)

#### Number of Infants Born Term and Preterm to Women with COVID-19

Gestational age (in weeks) was available for 11,005 (80.0%) live born infants.



### Fetal effect of COVID in pregnancy

- Reports of infection across all GA

   -> 50% after 20w GA
- No cases:

**POTENTIAL** 

**IMPACT** 

- a. teratogenicity
- b. disruption of organ development &/or function

Maternal respiratory illness

Maternal infection

Direct viral effect

Maternal critical illness

• No increased risk of fetal wellbeing, fetal demise (0.6-0.9%)



Hypoxemia

**MSOF** 

Inflammation

### Placenta pathology associated with COVID in pregnancy



- No evidence of virus in AF, vaginal secretions
- No virus in neonatal blood
- IgM detected in neonatal blood

Typically associated with FGR, PET, IUFD, PTB

Rationale for fetal surveillance after COVID recovery BPP / EFW Q2-4w > 24w GA

### **Neonatal effect of COVID in pregnancy**

- 91% babies test negative (COVID + mom)
- ~ 9% babies tested positive



### 176 cases of Neonatal COVID +

- 55% babies: mild symptoms
- Similar symptom profile
- 38% admitted to NICU
  - COVID, prematurity
  - mean LOS 8 days

#### Late onset COVID:

- 1. "Rooming in" for 72h after birth
- 2. Breast feeding NOT a risk

Rashetti et al, Nature (2020) RCOG Guideline (Oct 2020) University of Birmingham LSR (Sept 2020)

### **COVID** in Pregnancy: Initial Investigations

\*\* Vitals: HR >100, RR >20, temp > 38°C, O2 sat < 94% on RA
Venous blood gas</pre>

#### CXR

Lytes & CR: ? signs of dehydration Lactate: > 2 measure of "sepsis"

#### Remember:

Physiological changes of pregnancy can mask / compensate for maternal deterioration



(a) Normal



(c) Viral Pneumonia

(b) Bacterial Pneumonia



(d) COVID-19 Pneumonia



Thick patchy consolidation Ground Glass appearance Bilateral

### Pneumonia in pregnancy



- Edematous airway
- Less lung volume
- Increased secretions
- Increased minute ventilation
- Increased O<sub>2</sub> consumption

#### **RESPIRATORY CHANGES OF PREGNANCY**

Predispose to ILLNESS & RAPID DETERIORATION

#### **\*\*** Remember to interpret ABG in context of pregnancy

	Arterial blood gas measurement	1st trimester	3rd trimester	Nonpregnant
<b>†</b>	рН	7.42-7.46	7.43	7.4
<b>†</b>	PaO2 (mm Hg)	105-106	101-106	93
<b>,</b>	PaCO2 (mm Hg)	28-29	26-30	37
ļ	Serum HCO3 (mEq/L)	18	17	23





Allows for O2 shift to HbF

Allows for CO2 gradient from fetus to mom

### Mild Disease: Upper airway disease

#### **DOES NOT require hospitalization**

- remind to self-isolation at home, O2 sat monitor
- supportive therapy: acetaminophen, cough suppression, hydration
- education: warning signs (risk of deterioration d5-10)
- education KICK COUNTs
- education: s/s PTL
- F/U phone call from PH

### **Moderate to Severe Disease**

#### **Indications for hospitalization:**

- Shortness of breath (unable to walk across room, speak full sentence)
- o Cough with blood
- o Chest pain
- S/S dehydration (lytes, CR)
- Decreased level of consciousness
- Oxygen saturation < 94%
- CXR consistent with pneumonia

**Regardless of GA** 

Illness assessment

AND

Consideration of co-morbidity @ risk of moderate/severe disease

### **COVID in Pneumonia in Pregnancy**

#### Admission Investigations: predict the course, risk of deterioration

- Prognostic bloodwork: CBC, CRP & ferritin, LDH, LFTs, PT /PTT, fibrinogen, d-dimer (not to be used to detect risk of VTE as in non-pregnant population)
- **ECG, BNP, troponin**... *if any concern for cardiac involvement* <u>OR</u> *pre-existing cardiac disease*
- **2D ECHO** (maternal) if ICU admission/underlying cardiac condition
- Urine PCR , uric acid  *if any concern for PET*
- CT scan only if clinically indicated (rule out pulmonary embolism)



### **COVID** Pneumonia management in pregnancy

Primary principles:	A. symptom relief supportive care
	- anti-pyrexia
	- hydration
	- analgesia
	B. Rx superimposed / co-incident infections

Encourage PO fluid; TKVO- Avoid maintenance fluid		
If critical illness (ICU management consideration) Conservative strategy associated with decreased duration of mechanical vent "wet lung" Aim: negative daily balance 0.5-1.01		
If positive balance & respiratory symptoms: consider furosemide Rx		
** Community acquired pneumonia (CAP): Ceftriaxone + Azithromycin (solid consolidation on CXR) ? Aspiration pneumonia: Meropenum Ventilator acquired pneumonia (VAP): based on aspirate		

\*\* Co-existent UTI

### **Oxygen Therapy**

#### PRINCIPLES

- Maternal PaO2 drives fetal PaO2 (~30 mmHg), influenced by placenta volume
- Impact of maternal PaO2 & O2 sat: varies with umbilical O2 sat, pH & PO2
- PaCO2 gradient from fetus to mom to allow diffusion
- Target maternal >94% (no evidence)

#### ACTION

- O2 sat < 94% (or tachypnea > 20 RR):
   O2 by NP at 1-6 L/min.
- O2 sat < 94% with NP at 6 L/min: Simple facemask @ 6-10 L/min OR Venturi face mask @ FiO2 40%-60%
- If oxygen goals are not met by facemask
   Non-rebreather (TAVISH) facemask (at 10-15L/min)
   High flow nasal cannula (OptiFlow)

#### Awake, Non-Intubated Prone positioning:

- RCT only
- Not STD of care

**Indication to call ICU** 

No evidence from RCT Expert opinion

Maternal Surveillance & Warning signs:

Respiratory vitals RR, O2 sat, WOB

- Vitals q4h- if requiring increasing oxygen support increase vitals to q 1-2 with 1:2 RN care

If require:New use of oxygen supportRR increases despite O2 sat >94%Increasing amount of oxygen to maintain O2 sat>94%

\*\* WARNING SIGN OF RESPIRATORY DETERIORATION Consult ICU Pattern of rapid deterioration ass't with COVID

#### Warning signs of acute maternal deterioration / respiratory failure

Increased O<sub>2</sub> demands by 50% over 1-2h O2 sat < 94% despite O2 support > 4L/min O2 by facemask **\*\* TRANFER TO ICU** 

MEOWS data: Change in maternal vitals ~4h before deterioration

### **Mechanical Ventilation**

#### **Critical care decision**

#### Key Points to NB:

- Keep maternal PaO2 > fetal PaO2 but can run hypoxic
- Balance fetus against maternal cardiac output
- Hyper-oxygen: increased peripheral vascular resistance impact O2 delivery (uterus)
- Target O2 sat >90%
- Lowering PaCO2: uterine vasoconstriction
- Elevated PaCO2: affects O2 dissociation & fetal PaO2 changes fetal HR, MCA psv

#### **ARDS Management Principles:** \*\*

Analgesia: Opioid

<u>Sedation</u>: Benzodiazepine- Midazolam \* Propofol (Risk of elevated TG)\* Ketamine (Risk UC)

Paralysis: Rocuronium \*

\* Safe if BF \*\* Impact on fetal monitoring

Surveillance: P/F Ratio

PaO2 from the ABG

Target> 150

Fraction of inspired oxygen (FiO2)

### **Prone Positioning**





#### https://www.youtube.com/watch?v=SOgwakxeyXE

### **ECLS: Extracorporeal Membrane Oxygenation**





\*\* management in pregnancy

**Rationale:** Steroids decrease mechanical vent days & mortality with ARDS (except influenza)

**RECOVERY Trial:** Randomized Evaluation of steroids for COVID-19 pneumonia Trial Included pregnant and BF patients (n=6) Rx dexamethasone 6mg PO x 10d

Reduced rate of 28d mortality for patients:Mechanical ventilationRR 0.64Supplemental O2RR 0.84

No impact if <u>NOT</u> requiring O<sub>2</sub> support

\* not for mild disease at home or hospital

*Pre-viable gestational age (< 22w or >34w):* Methlyprednisolone\* 32 mg IV OD x 10d <u>or</u> discharge from hospital

**Periviable gestational age (22-25w):** if considering neonatal resuscitation & risk of preterm birth

Dexamethasone 6mg IM BID x 48 h

Methlyprednisolone 32 mg IV OD to complete 10 days or DC from hospital

Viable gestational age (25-34w GA): Dexamethasone 6mg IM BID x48 h

Methlyprednisolone 32 mg IV OD to complete 10 days or DC from hospital

Late ANC 34-36w GA: as above

#### Postpartum partum:

Dexamethasone\*\* 6mg IV OD x10 d or DC from hospital

- \* Prolonged/high dose steroid associated with fetal growth/end organ maturation
- \*\* No info on breastfeeding, methylprednisolone is safe

### Remdesvir and Tocilizumab: benefit in non-pregnant population

**Remdesvir:** 

Viral RNA polymerase inhibitor
<u>Goal:</u> reduce viral replication
\*Used with Ebola in pregnancy- no impact
\* Breastfeeding: no information BUT poor GI absorption...
<u>Indication</u>: moderate Dx requiring O2 BUT <u>not</u> mech vent/ECMO
<u>Dose</u>: IV 200mg x1 and then 4d of 100mg

Used early in disease spectrum

#### Tocilizumab: IL-6 receptor blocker

IL-6 driver of COVID inflammation; increased levels ass't with critical COVID, death <u>Goal</u>: reduce systemic inflammation

\* Used with rheumatic Dx in pregnancy: no birth defects, SA

\* Minimal detection in breastmilk

Indication: CRP >75

High flow nasal cannula/ventilation <u>Dose</u>: single IV dose of tocilizumab 8 mg/kg

### **Thromboprophylaxis & COVID**

**Rationale:** increased rate of VTE complications with ALL severe-critical COVID illness (16%)

Pulmonary microvascular thrombosis

\* extravascular fibrin (lung) + hypoxia + inflammation = CLOT

Mechanism

Hospital based VTE

\* immobility + prothrombotic state + endothelial activation + CLOT

Antepartum at home	Continue AC if previous pre Encourage hydration, mobi	escribed ilize Prophylactic dose LMWH
Admitted 2º COVID	AC recommended	Weight based
Admitted 2° OB reasonAC based on OB condition ? Stockings		<u>New RCT</u> : full dose AC for moderate Dx ? Improved outcome
Postpartum	Moderate-severe COVID: OB indications: Mild COVID:	AC recommended AC recommended AC <u>not</u> recommended

Hemodynamic status:	supine with wedge
	maintain BP > 90 systolic
	vasopressor: not contraindicated in pregnancy / BF
	"mimic" PET: use urine PCR, urate and BP to distinguish
	need 2D ECHO: critical illness link to cardiomyopathy

Glycemic control:If DM- monitor for DKA, monitor impact of steroidImprove critical care outcome if BS 7-10If prolonged illness: lower target based on fetal risk \*\* documented in DM

#### Medical Imaging:

Very Low Dose (<0.1mGy)		
Chest X ray	0.0005-0.01	
Head /Neck CT	0.001-0.01	
Low-Moderate Dose (0.1-10	mGy)	
Abdominal X Ray	0.1-3	
CT Chest/CT pulmonary angiography	0.01-0.66	
Nuclear Medicine (Low Dose Perfusion Only)	0.02-0.2	
Nuclear Medicine Ventilation Scan	0.1-0.3	
High Dose 10-50mGy		
Abdominal /pelvic CT	1.3-35	

Generally accept up to 50mGy in pregnancy

### ? When to deliver COVID+ with critical illness

No evidence from RCT Expert opinion

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

<u>General principle of critical care in pregnancy</u>: Delivery will not improve maternal status Delivery MAY trigger deterioration

#### Considerations: Why to delivery ..... ESP in T3

- Increased O<sub>2</sub> consumption
- Decreased functional residual capacity
- Risk of rapid decompensation
- Difficult airway

#### Suggested indications for delivery with critical COVID:

- Intrauterine infection
- DIC
- Hepatic or renal failure
- Compromised CV function due to gravid uterus
- Compartment syndrome
- Cardiac arrest
- Fetal demise
- GA of low morbidity / mortality .... > 34w

### ? When to deliver COVID+ with critical illness

#### ? Would delivery improve maternal status

- decrease O2 consumption
- increase lung volume

#### ? Would delivery compromise maternal status

- increased central volume: pulmonary edema
- pulmonary hypertension: volume will trigger RV failure

#### ? Would delivery improve fetal status

- maternal hypoxemia /hypercapnia affects uterine blood flow/fetal oxygenation
- risk of HIE *in utero* versus the risks of prematurity

**General principle:** Mechanical ventilation not indication for delivery if can maintain maternal oxygenation

\* consideration for GA (>34w), complexity of the delivery

\* may be indicated by OB indication: PPROM, PTL, APH, IUGR

<u>If >36w</u>: consider delivery as a tool to improve maternal status may not improve based on natural Hx of the disease

No evidence from RCT Expert opinion

### ? When to deliver with hypoxic respiratory failure



### ? When to deliver with hypoxic respiratory failure

\*\* Each institution & OB/Critical Care Team needs to set own criteria ......

Suggested algorithm (but should be discussed on a case by case basis)

45 cases in literature: (2018)77.8% maternal survival65% fetal survival

THEN: 9 cases with COVID: same

< 28w gestation: do **NOT** deliver prior to ECMO

low likelihood of fetus impairment / significant risk of prematurity

- >32w gestation: consider delivery prior to ECMO low likelihood of risk associated with prematurity \* cannulate after C/S in event of deterioration
- <u>28-32w gestation</u>: individualized discussion

pediatrics, obstetrics & intensivist

balance patient wishes, fetal status, maternal status/tolerance for delivery

### **Fetal Surveillance in ICU**

- ? What is the minimum surveillance requirement
- Daily FHR confirmation

#### ? What additional surveillance is indicated

<u>consider</u>: GA, maternal status, feasibility (location, maternal position)

- ? NST
- ? BPP
- ? Fetal Doppler study: UA, MCA, DV
  ? What abnormality will you act on
  ? What abnormality can you act on

<25w: Daily FH >25w: Daily NST >25w: Weekly BPP/ UA Doppler Biweekly EFW

\*\* No continuous monitoring

- **<u>NST</u>**: After viability & interpretable (> 25w)
  - Persistent tachycardia not explained by maternal status
  - Recurrent deep deceleration > 1h
- **<u>BPP</u>**: After viability (>25w)
- Weekly
- Anticipate decreased AFV, poor FT/FM/FBM due to sedation, narcotic
- Substitute UA Doppler +/- DV
- Deliver if abnormal DV .... If maternal status permits
- **EFW:** Baseline at admission for comparison after recovery

No evidence from RCT Expert opinion

### **Neonatal resuscitation in ICU**

- In the event of a spontaneous delivery.....
- In the event of perimortem C/S (\*at the direction of the ICU team- may not be of benefit; consider GA)

? What will be the neonatal resuscitation plan? What equipment is required at bedside in ICU

<22w GA: >25w GA: 23-25w GA:	comfort care full active case based on Canadian Pediatric Society Guideline previously expressed wishes / SDM request ethical consideration if no direction: risks of prematurity
<u>If viable:</u>	Vaginal delivery tray C/S delivery tray (scalpel on top) Neonatal resuscitation isolate/Code pink kit ** Education for ICU RN for s/s labor, ROM, calling an OB emergency /Code Pink

#### Criteria for transfer to Level III ICU for <u>critically ill</u> COVID + pregnant individual (ICU to ICU)

Based on risk for PTB

\*\* Need for ICU services, access to ECLS

Maternal medical indication: as per current guidelines for ICU

\*\* Regardless of GA

Maternal obstetrical indication:

- Gestational age >24 but < 32w GA: need level III care
- \*\* Gestational age: 22, 23w GA if a family/pre-expressed wish for neonatal resuscitation if spontaneous delivery
- Fetal condition requiring delivery at level III regardless of GA (> 25w)
- Maternal co-morbidity requiring delivery at level III regardless of GA (>25w)

#### Criteria for transfer to Level III for <u>moderately ill\*</u> COVID + pregnant individual (OB to OB)

• Defined as: need O2, OB co-morbidity, Medical co-morbidity, + prognostic indicators (include CXR)...

\*\* Based on risk for PTB

\*\* As listed above

### Intrapartum Management of Any COVID + /PUI patients

No evidence from RCT Expert opinion

- Recommend hospital birth if <u>unwell</u>
- CEFM for OB indications only
  - no evidence that asymptomatic /mild disease associated with abnormal FHR
- Hourly assessment of maternal status
  - Fluid status: strict euvolemia
  - Maintain O2 sat > 94%

Droplet Contact Precautions +/-N95

- No contraindication for FSE, fetal scalp sample \* virus not detect in AFV or blood
- <u>Management of second stage:</u> pushing <u>not</u> AGMP, but increased secretions/spray discourage active pushing consideration for assist VD (symptomatic, prevent prolong SS)
- Hand hygiene/Mask mom for baby contact & BF

### **Fever in Labor: Becoming a COVID PUI**

- Temperature >37.8oC
- 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) .... COVID NP SWAB and CONTACT/DROPLET PRECAUTIONS
- IF > 38°C ... initiate chorioamnionitis workup and treatment ... Blood cultures, Acetaminophen, Broad spectrum ABX
- After birth- Neonate also a PUI until mom test result is available

### **Post COVID infection**

- Serial BPP & EFW for fetal growth
- Educated re: s/s PTB
- No special precautions for intrapartum management

### Help patients to understand how to protect themselves & family



- Limit visitation to household members/ bubble
- Limit outside exposures to absolutely necessary
- Self monitor: screen for symptoms daily
- Get tested if you have symptoms
- Inform your OB care provider
- Extra caution if any RISK FACTORS
- Extra caution in T3 and weeks before due date



### Vitamin D Supplement and COVID

#### **Rationale:**

- Daily Vitamin D supplement shown to decrease risk of acute respiratory infections (any)
   effect greatest in those who are vitamin D deficient
- Vitamin D deficiency is common
  - especially in reproductive age women
  - @ risk: dark skin, limited sun exposure (seasonal, lockdown)
- <u>Correlation</u> between vitamin D deficiency & the rate of COVID infection & COVID death

\*\* no RCT proof that Vitamin D supplement decreases/prevents COVID\*\* Vitamin D driver of immune modulation

#### **Recommendation:**

Vitamin D supplement in pregnancy Dose: 2000 IU daily

> Martineau et al; (2015) Zemb et al, (2020) RCOG Guideline (Oct 2020) University of Birmingham LSR (Sept 2020)

#### mRNA Vaccine: Moderna, Pfizer



Protect against getting COVID & the severity of COVID if infected

#### All COVID vaccines:

- Do not contain mercury, aluminum or formaldehyde
- PEG safe in pregnancy
- Only contraindication: allergy

#### **Increased interval of dosing**

- Greatest effect from first dose
- 2<sup>nd</sup> dose is modest effect
- Immunity effect from "herd"

#### Adenovirus Vaccine: AstraZeneca / Oxford Vaccine / J&J Vaccine



- Spike protein gene enveloped in a harmless virus
- 64 66% effective
- significant impact on risk of severe disease

- not tested in pregnancy / BF
- enroll in the registry <u>https://c-viper.pregistry.com</u>
- no complication /VIIT reported to date

### Risk of VIIT:

Vaccine Induced Thrombocytopenia 1/ 250 000 - 1/ 1 000 000

hyper-autoimmune response pregnancy not a risk factor for VIIT hypercoagulable state of pregnancy not associated pregnancy VTE risk > VIIT risk

- Counsel that benefit of vaccine > risk of VIIT
- Rx for VIIT : IVIG, alternatives to heparin Rx



### Vaccine Guidance for Pregnant & Breastfeeding Individuals

- \*\* Pregnant & Breastfeeding individuals <u>excluded</u> from all vaccine trials
- \*\* Not tested **DOES NOT** mean not safe
- **\*\* NO** biologic rationale to suggest not safe
- \*\* NO systemic circulation of the vaccine
- \*\* Other vaccines are given in pregnancy: tDAP, FLU
- \*\* Goal to protect MOM but may have fetal and neonatal benefit

"Any pregnant / breastfeeding person may receive the vaccine should they choose after informed counselling"

- review of the benefits and risks of the vaccine
- review of the risk of acquiring COVID infection in pregnancy
- review of the risks / consequences of a COVID infection in pregnancy
- acknowledgment of the insufficiency of evidence for the use of COVID-19 vaccine in pregnant / breast feeding population

### **CDC vSafe Registry**

#### v-safe and Registry Monitoring people who report pregnancy

v-safe After Vaccination Health Checker Pregnant people reported, United States, as of April 19, 2021 **94,335**  v-safe COVID-19 Vaccine Pregnancy Registry Pregnant people enrolled, United States, as of April 19, 2021 **4,622\*** 



N= 35 691 pregnant individuals

#### No difference in side effects

\*\* Fever <1%

No difference in rate of adverse RX

### CDC vSafe Registry

derna #/%
.0) 92 (2.3)
.8.4) 1132 (28.6)
2.9) 1714 (43.3)
26.7) 1019 (25.7)
1 (<0.1)

Participant-Reported Outcome	Published Incidence*	V-safe Pregnancy Registry†
	%	no./total no. (%)
Pregnancy loss among participants with a completed pregnancy		
Spontaneous abortion: <20 wk <sup>15-17</sup>	10–26	104/827 (12.6)‡
Stillbirth: ≥ 20 wk <sup>18-20</sup>	<1	1/725 (0.1)§
Neonatal outcome among live-born infants		
Preterm birth: <37 wk <sup>21,22</sup>	8–15	60/636 (9.4)¶
Small size for gestational age <sup>23,24</sup>	3.5	23/724 (3.2)
Congenital anomalies <sup>25**</sup>	3	16/724 (2.2)
Neonatal death <sup>26</sup> <sup>††</sup>	<1	0/724
n- 877 completed pregnancies		

n= 827 completed pregnancies

### **Timing of vaccination**

Gestational age at diagnosis (weeks)		
<14	125	
14-27	273	$\neg$
28-37	218	
38-42	79	

Majority of COVID Dx in T2/T3

\*\* Want immunity before increasing risk of infection



\*\* 80-85% immunity >14d

Suggest optimal time ..... ANY TIME

"The SOGC supports the use of all COVID-19 vaccines approved in Canada in any trimester of pregnancy and during breastfeeding in accordance with regional eligibility."

### Vaccine antibodies in cord blood .... potential fetal /neonatal benefit

- 27 participants
- mRNA vaccination in T3



1:1 ratio of Cord and Maternal Ab concentration Cord Ab concentration increased with time after vaccination

### Vaccine antibodies in breastmilk .... potential neonatal benefit



- 87 breast feeding participants
- 2 doses of Pfizer vaccine while BF
- No adverse reactions, similar side effect profile



- Snap shot of the Canadian COVID experience to date
- Profile of the third wave: what we can expect based on experience from the UK
- COVID maternal disease spectrum
- COVID pregnancy outcomes
- COVID assessment & determine disposition
- COVID prognostic indicators / distinguish from PET
- COVID pneumonia & pharmacotherapies: steroid, remdesvir, tocilizumab, enoxaparin, ABX
- Management of oxygen therapy
- Maternal warning signs: when to call ICU
- ICU considerations:
  - hemodynamic parameters, glycemic control, medical imaging
  - ECMO & gestational age considerations
- Timing of delivery, fetal surveillance, neonatal resuscitation
- COVID recovered: fetal surveillance
- COVID vaccination

# **COVID in Pregnancy: What have we learned?**

Wendy L. Whittle MD PhD FRCSC Maternal Fetal Medicine Medical Director: Labor and Delivery & Antenatal Inpatient Care Sinai Health System; Toronto CA

