COVID-19 BRIEFING SESSION 12: IMPACT ON PREGNANT WOMEN, MOTHERS, AND CHILDREN

Speakers:

Luis Gomez MD, MScE
Maternal-Fetal Medicine Specialist
Perinatal Associates of Northern Virginia, Inova Health System

Ana Lia Graciano MD, FAAP, FCCM
Professor of Pediatrics
Division of Pediatric Critical Care Medicine
University of Maryland School of Medicine

Sergio Rimola MD, FACOG
Attending Physician Ob/Gyn
Department
Inova Fairfax Hospital

Moderator
Claudia Zamora
Founder and CEO
Zamora Consulting Group

Wednesday, September 29
at 7:00 p.m. ET

Registration:
bit.ly/NHMACOVIDBriefing
WELCOME AND HOUSEKEEPING

CLAUDIA ZAMORA
FOUNDER AND CEO
ZAMORA CONSULTING GROUP

PRESENTATIONS TO BE FOLLOWED BY Q&A
DISCUSSION AT THE END

TYPE QUESTIONS IN Q & A BOX

PARTICIPANT MICROPHONES AND VIDEO ARE OFF AND MUTED

RECORDING AVAILABLE NEXT WEEK ON NHMAMD.ORG
COVID-19 AND PREGNANCY

Luis M. Gómez, MD, MScE
INOVA Health System
Division of Maternal-Fetal Medicine
September 29, 2021
Celebrating Hispanic Heritage Month
DISCLOSURE

• No conflicts of interest

• I will be presenting data from the CDC, WHO, PAHO, IDSA, ACOG and SMFM
GOALS

• Define levels of COVID-19 severity (WHO guidelines)

• Understand pregnancy-associated morbidity and mortality

• Understand socio-demographic inequalities in morbidity and mortality

• Understand therapeutic interventions

• Share our INOVA Health System experience in COVID-19 & pregnancy
230,418,541 CASES

4,724,876 DEATHS

Source: WHO
WHY IS THIS TOPIC IMPORTANT?
COVID-19 PREGNANCY RISKS
CDC REPORT

4X MORE LIKELY TO REQUIRE VENTILATION

2X MORE LIKELY TO DIE FROM COVID-19
WHY IS THIS TOPIC IMPORTANT?

• Pregnancy is an independent risk factor for severe COVID-19 especially in patients with pre-existing comorbidities

• Compared with symptomatic non pregnant patients, infected pregnant individuals escalate faster to critical COVID-19 and have increased mortality

• Increased rate of adverse obstetric outcomes

Source: SMFM
## Pregnancy and perinatal outcomes

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>COVID-19 (%)</th>
<th>BACKGROUND (%)</th>
<th>VSAFE PREGNANCY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscarriage (&lt;20 w)</td>
<td>(not increased)</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>Stillbirth (&gt;20 w)</td>
<td>1.2</td>
<td>0.6</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>20</td>
<td>7-14</td>
<td>10</td>
</tr>
<tr>
<td>Gestational hypertension / Preeclampsia</td>
<td>19.5-62.4</td>
<td>10-15</td>
<td>15</td>
</tr>
<tr>
<td>Fetal growth restriction</td>
<td>11-12</td>
<td>3-7</td>
<td>1</td>
</tr>
<tr>
<td>Preterm birth</td>
<td>18.5-43.3</td>
<td>10.1</td>
<td>10</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>60</td>
<td>25-35</td>
<td>(not increased)</td>
</tr>
<tr>
<td>Venous thromboembolism</td>
<td>0.2-6</td>
<td>0.1-0.2</td>
<td>(&lt;0.001)</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>(not increased)</td>
<td>3-4</td>
<td>4</td>
</tr>
<tr>
<td>Small for gestational age</td>
<td>20-30</td>
<td>3-7</td>
<td>4</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>0.8</td>
<td>0.38</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: ACOG, SMFM
COVID-19 & Pregnancy in the Americas

- >270,000 pregnancies
- >2,600 maternal deaths
- Leading cause of maternal death in Mexico and Colombia
- Mexico, Argentina, and Brazil account for half of all COVID deaths among pregnant individuals in the region

Source: PAHO
COVID-19 & Pregnancy in the USA
(Jan 2020 – Sep 2021) 123,633 CASES
21,823 HOSPITALIZED 159 DEATHS

Source: CDC
COVID-19 & Pregnancy in the USA by age group (Jan 2020 – Sep 2021)
123,633 CASES
159 DEATHS

Source: CDC
COVID-19 & Pregnancy in the USA by race / ethnicity (Jan 2020 – Sep 2021)
123,633 CASES 159 DEATHS

Source: CDC
I’m pregnant.
How can I protect myself against COVID-19?

- Wash your hands frequently
- Avoid touching your eyes, nose and mouth
- Put space between yourself and others
- Cough or sneeze into your bent elbow or a tissue

If you have fever, cough or difficulty breathing, seek care early. Call beforehand, and follow medical advice.

#COVID19 #CORONAVIRUS

PREVENTION

EVALUATION
MANAGEMENT
THERAPEUTICS

IMMUNIZATION
COVID-19 Severity

MILD
(‘flu’ like symptoms)
• Fever (responding to acetaminophen)
• Cough
• Myalgias
• Anosmia
• Ageusia

MODERATE
(lower respiratory tract disease)
• Refractory fever
• Dyspnea
• Tachypnea (RR ≤30/min)
• SpO2 ≥94% (room air)
• Abnormal arterial blood gas
• Chest imaging: pneumonia

Source: SMFM, WHO
COVID-19 Severity

SEVERE (significant respiratory disease)
Prior symptoms PLUS:
• Tachypnea (RR >30/min)
• SpO2 <94% (with supplemental O2)
• PaO2 / FiO2 <300 *
• Chest imaging: >50% lung involvement

CRITICAL (multi-organ failure)
• Shock
• Need for high-flow nasal cannular or mechanical ventilation (intubation, ECMO)

* the lower PaO2 / FiO2, the greater the mortality risk (27-45%)

Source: SMFM, WHO
COVID-19 severity in pregnancy

• Compared to non pregnant people, pregnant patients are at increased risk of severe / critical illness and death

• Admission to the ICU         OR 2.85 (95% CI 1.08-7.52)
• Preterm delivery              OR 1.47 (95% CI 1.14-1.91)
• Maternal mortality            OR 2.85 (95% CI 1.08-7.52)

Allote et al, 2021
Zambrano et al, 2020
CDC MMWR 2020
Risk Factors for Illness Severity Among Pregnant Women With Confirmed SARS-CoV-2 – CDC (March 2020 – March 2021)

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>Adjusted RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE 25-29</td>
<td>1.32</td>
</tr>
<tr>
<td>AGE 30-34</td>
<td>1.43</td>
</tr>
<tr>
<td>AGE 35-39</td>
<td>1.53</td>
</tr>
<tr>
<td>AGE ≥40</td>
<td>1.66</td>
</tr>
<tr>
<td>Healthcare worker</td>
<td>1.23</td>
</tr>
<tr>
<td>BMI ≥30</td>
<td>1.33</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>1.41</td>
</tr>
<tr>
<td>CHTN</td>
<td>1.40</td>
</tr>
<tr>
<td>Diabetes M</td>
<td>1.57</td>
</tr>
<tr>
<td>1 condition</td>
<td>1.41</td>
</tr>
<tr>
<td>2 conditions</td>
<td>1.51</td>
</tr>
<tr>
<td>≥3 conditions</td>
<td>2.11</td>
</tr>
</tbody>
</table>

Galang et al, 2021
## Distribution of COVID-19 severity in pregnancy

<table>
<thead>
<tr>
<th>COVID-19 Severity</th>
<th>NICHD / MFM-U (n=1219) Mar-Jul 2020 *</th>
<th>INOVA HEALTH SYSTEM (n=717) Mar-Dec 2020 ¥</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>579 (47%)</td>
<td>425 (60.9%)</td>
</tr>
<tr>
<td>Mild</td>
<td>326 (27%)</td>
<td>232 (33.2%)</td>
</tr>
<tr>
<td>Moderate</td>
<td>173 (14%)</td>
<td>30 (4.3%)</td>
</tr>
<tr>
<td>Severe</td>
<td>98 (8%)</td>
<td>7 (1%)</td>
</tr>
<tr>
<td>Critical</td>
<td>43 (4%)</td>
<td>4 (0.6%)</td>
</tr>
</tbody>
</table>

* Metz et al, 2021
¥ Gomez et al, 2021
COVID-19 & Pregnancy in the USA: ICU admission, need for invasive ventilation or ECMO (Jan 2020 – Sep 2021) 123,633 CASES

Source: CDC
# Treatment of COVID-19

<table>
<thead>
<tr>
<th>STAGE</th>
<th>Asymptomatic</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEATURES</td>
<td>Positive test</td>
<td>Fever, cough, changes in</td>
<td>Dyspnea</td>
<td>RR &gt;30</td>
<td>Respiratory and multi organ failure</td>
</tr>
<tr>
<td></td>
<td>No symptoms</td>
<td>taste / smell</td>
<td>SpO2 &gt;94%</td>
<td>SpO2 &lt;94%</td>
<td>failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Imaging: pneumonia</td>
<td>Lung infiltrates</td>
<td>Shock</td>
</tr>
<tr>
<td>PATHOGENESIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Viral replication</td>
<td></td>
<td>Inflammation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hypercoagulability</td>
<td></td>
</tr>
<tr>
<td>THERAPEUTIC</td>
<td></td>
<td></td>
<td></td>
<td>Dexamethasone</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ab cocktail</td>
<td></td>
<td>Monoclonal Ab</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monoclonal Ab</td>
<td></td>
<td>Remdesivir</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convalescent plasma</td>
<td></td>
<td>Enoxaparin</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JAK inhibitors</td>
<td></td>
</tr>
</tbody>
</table>

Source: IDSA
Oxygen saturation in pregnancy

• For non pregnant patients: $\geq 92\%$ or greater
• Recommended O2 saturation in pregnancy is $\geq 95\%$

ADMISSION TO THE ICU

• **Inability to maintain O2 saturation $\geq 95\%$** (pulse oximetry) with supplemental
Pharmacological treatment in pregnant women with moderate symptoms of coronavirus disease 2019 (COVID-19) pneumonia

Sebastian Nasrallah, Anh Q. Nguyen, Laura Hitchings, Jenny Q. Wang, Sara Hamade, G. Larry Maxwell, Alfred Khoury & Luis M. Gomez
(A) Remdesivir started <48 hours from hospital admission (N=17)

(B) Remdesivir started >48 hours from hospital admission (N=7)

RDV <48 hours

RDV >48 hours

Nasrallah et al, 2021
Time to clinical recovery in pregnant women with moderate COVID-19

Cumulative Recovery %

Hospital days

RDV <48h
RDV >48h
No RDV

Nasrallah et al, 2021
COVID-19 & Teen Pregnancy in the USA – Year 2020
25,649 pregnancies  1,177 Adolescents (4.5%)

Source: CDC
Pregnancy outcomes in pregnant adolescent patients infected with SARS-CoV-2

Anh Q Nguyen, Ellen Murrin, Sebastian Nasrallah, Laura Hitchings, Jenny Wang, Luis M Gomez
## COVID-19 in Pregnancy (INOVA): Adolescents vs. adults

<table>
<thead>
<tr>
<th>TOTAL COVID-19 (N=743)</th>
<th>Adolescents (N=48) – 6.5%</th>
<th>Non adolescents (N=695) – 93.5%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yo (mean, range)</td>
<td>18 (15-19)</td>
<td>27 (20-44)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ethnicity:</td>
<td></td>
<td></td>
<td>0.006</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>44 (91.7%)</td>
<td>518 (74.5%)</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Black</td>
<td>3 (6.3%)</td>
<td>64 (9.2%)</td>
<td></td>
</tr>
<tr>
<td>- White</td>
<td>1 (2%)</td>
<td>35 (5.3%)</td>
<td></td>
</tr>
<tr>
<td>- Asian</td>
<td>0</td>
<td>30 (4.3%)</td>
<td></td>
</tr>
<tr>
<td>- Other</td>
<td>0</td>
<td>48 (6.9%)</td>
<td></td>
</tr>
<tr>
<td>Medical insurance:</td>
<td></td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>- Charity clinic</td>
<td>24 (50%)</td>
<td>436 (62.7%)</td>
<td></td>
</tr>
<tr>
<td>- No Charity</td>
<td>24 (50%)</td>
<td>259 (37.3%)</td>
<td></td>
</tr>
<tr>
<td>GA at dx (weeks-days, range)</td>
<td>34-5 (7-1 to 41-0)</td>
<td>31-4 (4-0 to 41-0)</td>
<td>0.015</td>
</tr>
</tbody>
</table>

Nguyen et al, 2021
Severity of COVID-19 in Pregnancy (INOVA): Adolescents vs. adults

<table>
<thead>
<tr>
<th></th>
<th>Adolescents SARS-CoV-2-pos (N=48)</th>
<th>Non-adolescents SARS-CoV-2-pos (N=695)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asymptomatic</td>
<td>38 (79.2%)</td>
<td>422 (60.7%)</td>
<td>0.01*</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>10 (20.8%)</td>
<td>273 (39.3%)</td>
<td></td>
</tr>
<tr>
<td>- Mild</td>
<td>6 (12.5)</td>
<td>232 (33.4%)</td>
<td>0.06</td>
</tr>
<tr>
<td>- Moderate</td>
<td>1 (2.1%)</td>
<td>30 (4.3%)</td>
<td></td>
</tr>
<tr>
<td>- Severe</td>
<td>1 (2.1%)</td>
<td>7 (1%)</td>
<td></td>
</tr>
<tr>
<td>- Critical</td>
<td>2 (4.2%)</td>
<td>4 (0.6%)</td>
<td></td>
</tr>
</tbody>
</table>

* Adjusted p =0.03, adjusted OR 1.9, 95% CI 1.4-2.8

Nguyen et al, 2021
## COVID-19 in Pregnancy (INOVA): Infected vs. non-infected adolescents - Demographics

*Nguyen et al, 2021*

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Total (N=442)</th>
<th>Positive (N=48)</th>
<th>Negative (N=394)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnicity:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>44 (91.7%)</td>
<td>48 (12.2%)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Non-Hispanic:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Black</td>
<td>3 (6.3%)</td>
<td></td>
<td>41 (10.4%)</td>
<td></td>
</tr>
<tr>
<td>- White</td>
<td>1 (2%)</td>
<td></td>
<td>52 (13.2%)</td>
<td></td>
</tr>
<tr>
<td>- Asian</td>
<td>0</td>
<td></td>
<td>2 (0.5%)</td>
<td></td>
</tr>
<tr>
<td>- Other</td>
<td>0</td>
<td></td>
<td>214 (54.3%)</td>
<td></td>
</tr>
<tr>
<td>- Unavailable</td>
<td>0</td>
<td></td>
<td>37 (9.4%)</td>
<td></td>
</tr>
<tr>
<td><strong>Medical insurance:</strong></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>- None (Charity clinic)</td>
<td>24 (50%)</td>
<td></td>
<td>31 (7.9%)</td>
<td></td>
</tr>
<tr>
<td>- Medicaid</td>
<td>21 (43.8%)</td>
<td></td>
<td>149 (37.8%)</td>
<td></td>
</tr>
<tr>
<td>- Private</td>
<td>3 (6.2%)</td>
<td></td>
<td>204 (51.8%)</td>
<td></td>
</tr>
<tr>
<td>- Self pay</td>
<td>0</td>
<td></td>
<td>10 (2.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Body mass index (mean)</strong></td>
<td>29.5</td>
<td>29.3</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>
COVID-19 in Pregnancy (INOVA): Infected vs. non infected adolescents and pregnancy outcomes

<table>
<thead>
<tr>
<th></th>
<th>Teen SARS-CoV-2-pos (N=48)</th>
<th>Teen SARS-CoV-2-neg (N=394)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gestational age at delivery (weeks-days, range)</strong></td>
<td>39-1 (35-5 to 42-0)</td>
<td>38-4 (22-0 to 41-0)</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Preterm delivery &lt;37 weeks</strong></td>
<td>2 (4.2%)</td>
<td>41 (10.4%)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Cesarean delivery</strong></td>
<td><strong>12 (25%)</strong></td>
<td><strong>47 (11.9%)</strong></td>
<td><strong>0.03</strong></td>
</tr>
<tr>
<td>Vaginal delivery, assisted</td>
<td>1 (2.1%)</td>
<td>22 (5.6%)</td>
<td>NS</td>
</tr>
<tr>
<td>Vaginal delivery, non assisted</td>
<td>35 (72.9%)</td>
<td>325 (82.5%)</td>
<td></td>
</tr>
<tr>
<td>Birthweight, grams (range)</td>
<td>3,236 (2,150 to 3,990)</td>
<td>3,127 (310 to 5,440)</td>
<td>NS</td>
</tr>
<tr>
<td>Fetal growth restriction</td>
<td>2 (0.9%)</td>
<td>4 (1%)</td>
<td>NS</td>
</tr>
<tr>
<td>Apgar score at 5 minutes</td>
<td>8.8 (8-9)</td>
<td>8.7 (1-9)</td>
<td>NS</td>
</tr>
<tr>
<td>NICU admission</td>
<td>3 (6.3%)</td>
<td>62 (15.7%)</td>
<td></td>
</tr>
</tbody>
</table>

*Nguyen et al, 2021*
Prone positioning is not contraindicated during pregnancy

1. Begin by lying in prone position on a flat bed for 30 minutes to 2 hours.
2. Switch to lying on your right side for 30 mins to 2 hours.
3. Switch to 30 minutes to 2 hours of sitting up (30-60 degrees).
4. Switch to lying on your left side for 30 minutes to 2 hours.
5. Switch to semi-proning position for 30 minutes to 2 hours.
6. Return to proning position for 30 minutes to 2 hours. Repeat cycle...
How can COVID-19 affect the unborn or newborn baby? What about breastfeeding?

- Unknown if the virus can be passed to the fetus or baby during pregnancy or delivery.
- Unlikely that COVID-19 can pass through breast milk and cause infection in the baby.
- It seems safe to feed breast milk when positive for COVID-19.
- COVID-19 should not stop from breastfeeding.
- Conflicting information on increased risk of stillbirth or neonatal death.

Source: ACOG
Women with COVID-19 can **breastfeed** if they wish to do so. They should:

1. Practice respiratory hygiene and wear a mask
2. Wash hands before and after touching the baby
3. Routinely clean and disinfect surfaces

#COVID19 #CORONAVIRUS
How to avoid passing COVID-19 to the newborn?

- Breastfeed safely, with good respiratory hygiene
- Wash your hands before and after touching the baby
- Wash your hands before touching any breast pump or bottle parts and clean all pump and bottle parts after use
- Keep all surfaces clean
- Wear a medical mask, during any contact with the baby including feeding
- Do not put a mask over the newborn’s face
- Use of a support person

Source: ACOG
I’m pregnant. How can I protect myself against COVID-19?

- Wash your hands frequently
- Avoid touching your eyes, nose and mouth
- Put space between yourself and others
- Cough or sneeze into your bent elbow or a tissue

If you have fever, cough or difficulty breathing, seek care early. Call beforehand, and follow medical advice.

World Health Organization

#COVID19 #CORONAVIRUS
PREGNANT INDIVIDUALS MAY BE AT INCREASED RISK FOR SEVERE ILLNESS FROM COVID-19 COMPARED WITH THEIR NON PREGNANT COUNTERPARTS

PREGNANT INDIVIDUALS AND THEIR FAMILIES SHOULD TAKE STEPS TO STAY HEALTHY AND REDUCE THEIR RISK FOR GETTING COVID-19
COVID Vaccination in Children: what we know and what we don’t

Ana Lia Graciano, MD, FAAP, FCCM
Professor of Pediatrics
Medical Director PCICU
Division of Critical Care Medicine
University of Maryland Children’s Hospital
• No Disclosures
Objectives

• Describe the trajectory of COVID-19 in children since first reported
• Describe the characteristics of the Multisystem Inflammatory Syndrome in Children (MIS-C)
• Discuss current knowledge of FDA-approved COVID vaccine for children
From outbreak to pandemic

- Dec 29: Pneumonia of unknown etiology
- Jan 7: Novel coronavirus officially announced SARS-CoV-2
- Jan 11: First death in China
- Jan 13: First case outside China (Thailand)
- Jan 29: Death toll > 130,000
- Feb 11: WHO names a new disease
- March 11: WHO declares a Pandemic
Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults
An “unusual” illness

• Children admitted to ward or to intensive care units
  – Prolonged fever
  – Sore throat
  – Headache
  – Abdominal pain/Vomiting/Diarrhea
  – Skin rashes/conjunctivitis
  – Shock
  – Myocardial dysfunction
  – Kawasaki-like /Toxic Shock like
  – Elevated markers of inflammation

• The majority were SARS-CoV-2 PCR negative but had positive antibodies
Hyperinflammatory shock in children during COVID-19 pandemic

Shelley Riphagen ¹, Xabier Gomez ², Carmen Gonzalez-Martinez ³, Nick Wilkinson ³, Paraskevi Theocharis ³

Lancet-May 6, 2020

Laboratory
- Elevated DD, CRP, Troponin
- SARS-CoV-2 PCR
  - negative (n=6)
  - positive (n=2, 1 post-mortem)
- Echocardiogram: prominent coronaries

Treatment
- Intubated (n=7)- cardiogenic shock
- Vasopressors
- IVIG
- Ceftriaxone/Clindamycin
- Aspirin
- ECMO (n=1, death)

- N=8
- Age 4-14 years
- Weight > 75th percentile
- Contact with COVID-19
- Fever (39-40C))
- Rash/Conjunctivitis
- Edema
- GI symptoms
- Vasoplegic shock
Multisystem Inflammatory Syndrome in Children (MIS-C)

**CDC Case Definition**

- < 21 years *AND*
- Fever + laboratory evidence of inflammation; *AND*
- Evidence of clinically severe illness requiring hospitalization; *AND*
- Multisystem (≥ 2) organ involvement (cardiac, renal, hematologic, gastrointestinal, dermatologic or neurological); *AND*
- Positive for current or recent SARS-CoV-2 infection by RT-PCR, serology, or antigen test; *OR* exposure to a suspected or confirmed COVID-19 case within the 4 weeks prior to onset of symptoms
Laboratory and Imaging in MIS-C

- Lymphopenia
- Neutrophilia
- Thrombocytopenia
- Elevated markers of inflammation
  - CRP
  - Sedimentation Rate
  - LDH
  - Fibrinogen
  - Ferritin
  - D-Dimers
  - Procalcitonin
  - Interleukin-6
- Elevated cardiac markers
  - Troponin
  - BNP or NT-proBNP
- Hypoalbuminemia
- Mildly elevated liver enzymes
- Echocardiogram
  - Depressed cardiac function
  - Pericardial effusion
  - Mitral regurgitation
  - Coronary abnormalities
- Chest-X ray
  - Normal
  - Consolidations (more common in acute COVID-19)
  - Pleural effusions
- Abdominal Imaging
  - Ascites
  - Bowel and mesenteric inflammation
Multisystem Inflammatory Syndrome in U.S. Children and Adolescents

B  Temporal Relationship between MIS-C and Covid-19 Activity in Persons <21 Yr of Age

Percentage testing positive for SARS-CoV-2

No. of cases of MIS-C
Burden of COVID-19 in Children

- All ages susceptible to SARS-CoV-2 infection
- Over 5 million pediatric cases reported in the US
- Previously healthy children are at risk
- Underlying medical conditions (obesity, asthma, chronic medical conditions) are risk factors for severity
- Children with severe COVID-19 may develop respiratory failure, myocarditis, shock, acute renal failure, coagulopathy, encephalopathy and multiorgan system failure
- There is a **high incidence of cardiovascular involvement** associated with Multisystem Inflammatory Syndrome in Children (MIS-C): myocarditis, arrhythmias, coronary anomalies
- *Hospitalizations rates in the US are higher among Hispanic/Latino children and non-Hispanic Black children compared with non-Hispanic White children.*
- *Mortality in children is much lower than in adults but nonetheless pediatric deaths are documented*
US COVID-19 Mortality in Children – CDC (9/22/21)

COVID-19 documented pediatric deaths
- N = 1088 (~0.02-0.03%)
- Male 69% > Female 31%

Figure 1. Provisional COVID-19 deaths by age group, by sex: United States

- 0-4 years
- 5-18 years

N = 748
N = 340
Vaccines approved for children in the US

- **Pfizer-BioNtech (BNT162b2)**
  - Approved for ≥ 16 years of age (August 2021)
  - EAU for ≥ 12-15 years (May 2021)
  - 2 doses 3 weeks apart
  - Optimal protection occurs 7 days after second dose
  - 3rd dose can be given to immunocompromised children at least 28 days following the second dose

- **Moderna (mRNA1273)** - not approved yet
  - KidCOVE study (ongoing)
  - Not approved yet in the US

- **Both are mRNA vaccines**
  
  [https://www.fda.gov/media/144413/download](https://www.fda.gov/media/144413/download)
  
  [https://www.cvdvaccine-us.com](https://www.cvdvaccine-us.com)
BioNtech Vaccine Common Side Effects

- Pain at injection site
- Fatigue, muscle pain
- Headache
- Fever, chills
- Joint pain
- Lymphadenopathy
Myocarditis and COVID-19 mRNA vaccine

- Post-marketing data demonstrate increased risks of myocarditis and pericarditis particularly within 7 days following the second dose
- Incidence: 12.6 cases per million doses of second dose
- Risk higher among young males (12-39 years of age)
- Clinical and laboratory presentation:
  - Chest pain, palpitations, shortness of breath
  - Elevated troponin
  - EKG- ST elevation
  - Cardiac MRI suggestive of myocarditis
- *Most individuals have resolution of symptoms with conservative management*
- Information on potential long-term sequelae is not known
## Acute Myocarditis and Acute Pericarditis- CDC Working Definitions

### CDC Working Case Definitions

<table>
<thead>
<tr>
<th>Probable Case</th>
<th>Confirmed Case</th>
<th>Proband Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute Myocarditis</strong></td>
<td><strong>Presence of ≥ 1 new or worsening of the following clinical symptoms</strong></td>
<td><strong>Acute Pericarditis</strong></td>
</tr>
<tr>
<td></td>
<td>• chest pain/ pressure/ discomfort</td>
<td>• Presence of ≥ 2 new or worsening of the following clinical symptoms</td>
</tr>
<tr>
<td></td>
<td>• dyspnea/shortness of breath</td>
<td>• acute chest pain (typically described as pain made worse by lying down, deep inspiration, cough, and relieved by sitting up or leaning forward, although other types of chest pain may occur) §</td>
</tr>
<tr>
<td></td>
<td>• palpitations</td>
<td>• pericarditis rub on exam</td>
</tr>
<tr>
<td></td>
<td>• syncope</td>
<td>• new ST-elevation or PR-depression on ECG</td>
</tr>
<tr>
<td></td>
<td><strong>AND ≥ 1 new finding of</strong></td>
<td>• new or worsening pericardial effusion on echocardiogram or MRI</td>
</tr>
<tr>
<td></td>
<td>• elevated troponin above upper limit of normal</td>
<td>• Autopsy cases may be classified as pericarditis on basis of meeting histopathologic criteria of the pericardium</td>
</tr>
<tr>
<td></td>
<td>• abnormal ECG or rhythm monitoring findings consistent with myocarditis ‡</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• abnormal cardiac function or wall motion abnormalities on echocardiogram</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• cardiac MRI findings consistent with myocarditis †</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• AND no other identifiable cause of the symptoms and findings</td>
<td></td>
</tr>
</tbody>
</table>

‡ Definite diagnosis requires pathologic confirmation of myocarditis

† Clinically significant in a patient with acute pericarditis

§ Other terms may be used for the acute chest pain in addition to pericarditis rub, including pericardial friction rub, pericardial effusion, pericarditis, pericardial disease, pericardial inflammation, or pericardial tamponade.
Summary

• Fewer cases of COVID-19 have been reported in children compared with adults. But the number and rate of cases have been steadily increasing since March 2020.

• Myocardial dysfunction and elevated cardiac markers are common in children with severe COVID and MIS-C.

• Myocarditis temporally associated with mRNA vaccine has been reported in children and young adults (mostly men).

• Most cases reported after the second dose and within the first week after vaccination.

• Most cases tend to be mild.

• Suspected cases require a careful history, physical exam, laboratory work, EKG, echocardiogram and in some cases cardiac MRI.

• No specific therapy is recommended at present time. Care is largely supportive.

• At this time patients with myocarditis/pericarditis after first dose of mRNA vaccination should defer a second dose.
COVID-19 mRNA vaccination is recommended in all populations for which a benefit has been established as benefits of the vaccine outweighs the risks.

Many questions remain:
- Modifications to the vaccine schedule
- Best management of postvaccine myocarditis
- Frequency and type of follow up assessments
- Recommendations on physical activities after vaccine related myocarditis
- Long-term prognosis of vaccine related myocarditis is unknown
- And many more....
THANK YOU

agraciano@som.umaryland.edu
- Evaluated risk of adverse events among individuals ≥ 16 years of age who had received the Pfizer-BioNtech vaccine and risk of the same events after SARS-CoV-2 infection

- Used multiple data sets from the largest integrated payer provider health care organization in Israel in conjunction with data on SARS-CoV-2 PCRs and data on COVID-19 vaccine administration from the Israel Ministry of Health

- Matched eligible vaccinated individuals to unvaccinated controls
Figure 3. Risk Ratios for Adverse Events after Vaccination or SARS-CoV-2 Infection.

Estimated risk ratios for adverse events after vaccination or SARS-CoV-2 infection are shown. The risk ratio on the y axis is presented on a logarithmic scale to facilitate comparison of both increased and decreased risk. 1 bars indicate 95% confidence intervals.
FIGURE 2. COVID-19-associated weekly hospitalizations per 100,000 children and adolescents,* by age group — COVID-NET, 14 states,† March 1, 2020–August 14, 2021 (3-week smoothed running averages)§

* Rates are subject to change as additional data are reported.
COVID-19 VACCINES DURING PREGNANCY

► SERGIO RIMOLA, MD FACOG
► NHMA DC METRO CHAIR
► INOVA HEALTH SYSTEM
The data indicate that pregnancy is an independent risk factor for severe COVID-19 disease.

Hispanic, Latinx, and black patients are disproportionally affected by severe maternal morbidity and mortality and have a disproportionally higher incidence of COVID-19 infection and death.
Currently three COVID-19 vaccines authorized for use in the United States.

mRNA vaccines (Pfizer-BioNTech BNT 162b2 and Moderna mRNA 1273 vaccines)

The Pfizer and Moderna contain mRNA, a genetic material that encodes the SARS-CoV-2 spike S protein that elicit neutralizing antibody responses to the S-protein and confer superior protective immunity compared with N-protein targeted antibodies.

No live vaccines, with rapid degradation by normal cellular processes.

No risk of genetic modification to people receiving the vaccine.
Uses an adenovirus to carry the gene for the coronavirus spike S protein into the host cell to produce for spike protein.

Triggering both antibody and cell-mediated immune responses.

The risk of genetic modification from adenovector vaccines is also low.

Viral DNA carrying the gene encoding the coronavirus spike protein enters the host nucleus to be transcribed but is not integrated into the host’s DNA.

On April 13, 2021, the US FDA and CDC recommended a pause due to a rare, severe type of blood clot called cerebral venous thrombosis (CVST)

Thrombosis with Thrombocytopenia syndrome (TTS) is a rare condition
Data from clinical trials indicate that the efficacy of Pfizer vaccine after the second dose is 95% (95% CI, 90.3%-97.6%), and the efficacy of Moderna is 94.1% (95% CI, 89.3%-96.8%).

Both vaccines are highly effective in producing vaccine-antibody titers in pregnant and lactating women.

Observational data demonstrate that the clinical effectiveness of mRNA vaccines is pregnant people is high.

Delta variant: Pfizer 42-96%. Moderna 66-95%

Data released on July 28 a booster dose of Pfizer strongly boosted protection against Delta variant.
The COVID-19 pandemic demonstrates the urgency of including pregnant individual in clinical research.

Medical societies were unsuccessful in advocating for inclusion of pregnant individuals in the COVID-19 vaccine trials.

Tendencies that contribute to exclusion of pregnant individuals include narrow focus on fetal risk rather than the health of the dyad.

Exclusion of pregnant individuals from trials of COVID-19 vaccines has led to inconsistent policies.
COVID-19 VACCINES IN PREGNANCY

- During the initial roll out of COVID-19 vaccines on mid December 2020 there was not a clear guidance on recommendations during pregnancy and nursing.

- On March results from CDC’s v-Safe voluntary after vaccination health check system showed that more than 30,000 women who received the Moderna and Pfizer-BioNTech vaccines have reported pregnancies, with no specific safety issues identified with similar side effects for pregnant and non-pregnant individuals.

- Birth outcomes of 827 completed pregnancies, rates of complications were not significantly different from those of unvaccinated pregnant women.
The CDC data indicated that it was safe for pregnant women to receive these vaccines, but without a strong formal recommendation.

As a result, the CDC, The American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine strongly recommended that pregnant and lactating women have access to COVID-19 vaccines.

Encouraging a conversation with health care providers about potential benefits and unknown risks regarding receipt of the vaccine.

This conversation may be helpful but not required prior to vaccination.
The CDC Advisory Committee on Immunization Practices (ACIP) reports that preclinical studies have been reassuring.

To date more than 139,000 pregnant people have self-reported within the CDC v-safe program,acute side effects do not appear to differ from those on the general population.

More than 3,900 have been followed longitudinally in a registry for outcomes such as miscarriages, stillbirth, pregnancy complications, ICU admissions, adverse birth complications, neonatal death, infant hospitalizations and birth defects were similar.
Available data from the Janssen Biotech (J&J) also include DART data and 8 pregnancies inadvertently enrolled in clinical trials.

Previous vaccine trials using adenovirus vectors in pregnant patients, eg, Ebola vaccine, have not demonstrated adverse pregnancy outcomes.

Safety monitoring in pregnant people is ongoing.

Pfizer and Janssen are planning clinical trials in pregnant volunteers.
On 8/9/2021 20 leading organizations released a statement of strong medical consensus for vaccination of pregnant individuals against COVID-19.

- Strongly urging all pregnant individuals, along with recently pregnant, planning to become pregnant, lactating and other eligible individuals to be vaccinated.

- Pregnant individuals are at increased risk of severe COVID-19 disease infection, including death particularly with increasing number of Delta variant.

- Vaccine is both safe and effective when administered during pregnancy.
COVID-19 VACCINES IN PREGNANCY


- CDC encourages all pregnant people or people who are thinking about becoming pregnant and those breastfeed to get vaccinated to protect themselves from COVID-19. (Dr Rochelle Walensky)

- A new CDC analysis of current data from the v-safe pregnancy registry in early pregnancy did not find any increase of miscarriage among nearly 2,500 pregnant who received mRNA COVID-19 vaccine before 20 weeks, around 13%, 11-16% expected rate of miscarriage.

- Previously, data from three safety systems did not find any safety concerns for pregnant vaccinated late in the pregnancy or for their babies.
Receipt of mRNA COVID-19 Vaccines and risk of spontaneous abortion

- Study published on September 8 on NEJM group.
- Analyzed data from CDC v-Safe program to determine the cumulative risk of spontaneous abortion from 6 to less than 20 weeks of gestation.
- 2,456 participants.
- The cumulative risks of spontaneous abortion were within the expected risk range.
- The findings add to the accumulating evidence about the safety of mRNA COVID-19 vaccination in pregnancy.

“With today’s FDA licensure clinicians can feel more confident in recommending vaccination for their patients including pregnant patients.

ACOG, The Society of Maternal-Fetal Medicine, The CDC and 18 organizations representing maternal care experts and public health professionals all recommending vaccination during pregnancy.

Vaccination in pregnancy is safe and effective.

The single best tool we have to protect us as individuals and fellow members of our communities against COVID-19
January 2021 online prospective cohort study of adults primarily located in the USA who were pregnant, lactating, or planning pregnancy at the time of COVID-19 vaccine.

17525 individuals Pfizer (10790) Moderna (6592) 17005 reported reaction after first dose. Pain at injection 91.4%, fatigue 31.3%. After second dose fatigue higher 69.2%.

Odds of severe reactions were statistically significantly decreased among pregnant individuals.

This large prospective cohort study found that COVID-19 vaccines were well-tolerated among individuals that were, pregnant, lactating of planning pregnancy. (Published 8/17/21 JAMA Network Open)
VACCINE REACTIONS
COVID-19 IN PREGNANCY

- UAB HOSPITAL ICU POPULATION INCLUDES 'ALARMING' NUMBER OF PREGNANT WOMEN
- 'A REAL TRAGEDY': IN COVID-19 PANDEMIC, RATES OF STILLBIRTHS DOUBLE IN MISSISSIPPI.

COVID affecting non-vaccinated pregnant women

Hospitalizations of pregnant women with COVID at UAB Hospital has soared since March, including those needing ICU care.

UAB PREGNANT COVID-POSITIVE PATIENTS

**ADMISSIONS**

<table>
<thead>
<tr>
<th>Month</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Feb</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Mar</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Apr</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>May</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Jun</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Jul</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Aug</td>
<td>80</td>
<td>39</td>
</tr>
</tbody>
</table>

- **39 PATIENTS** August 1-19

**ICU PATIENTS**

<table>
<thead>
<tr>
<th>Month</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Feb</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Mar</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Apr</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>May</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Jun</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Jul</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>Aug</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

- **10 Pregnant Patients in ICU** August 1-19
  - 70% (7 intubated)
Study publishes in AJOG September 18, 2021

- 64 vaccinated parturient women and 11 parturient women who had COVID-19 during pregnancy.

- Significant higher SARS CoV-2 IgG levels in maternal serum and cord blood among vaccinated women (p<0.0001)

- Study demonstrated efficient transfer of SARS CoV-2 IgG across the placenta from women vaccinated during pregnancy to their neonates.

- In addition to maternal protection against COVID-19, the vaccine may also provide neonatal humoral immunity.
COVID-19 VACCINES IN PREGNANCY

- Data from CDC as 9/4/21 vaccinations in pregnancy
- 161,764 reported pregnancy in V-Safe program
- All races/ethnicity 25.2%
  - Hispanic/Latino 21.4%
  - White 27.3%
  - Black 13.8%
  - Asian 35.7%
  - Other 24.7%
COVID-19 VACCINES IN PREGNANCY

- Vaccine hesitancy
- Cultural and linguistical competent conversation
- Positive motivation
- Empathetic engagement to get to the roots of hesitancy
- Build trust
- Thank you!
QUESTIONS

PLEASE SUBMIT YOUR QUESTIONS IN THE Q & A Box
THANK YOU

Contact us
- NMHA – NHMAmd.org
- NHHF- NHMAFoundation.org
- Questions: nhma@nhmamd.org
- Become a Vaccinate4All Champion at nhmamd.org/vaccinate4all

Don’t miss!
- NHMA 25th Annual Hispanic Health Conference – March 24-27, 2022
- Join as an NHMA member or give tax-deductible donation to NHHF or Amazon Smile Today

@NHMAMD
COVID-19 BRIEFING SESSION 13:
VaccinateForAll: How Medical Associations, the Private Sector, and the Media are Mobilizing Against COVID-19
October 27, 2021 • 7 p.m. ET

Panel 1
Moderator: Elena Rios, MD, MSPH, FACP
President & CEO NHMA
Tracy Sun, MPH
Community Engagement Manager at the Asian & Pacific Islander American Health Forum (APIAHF)
Bobby Mukkamala, MD
AMA Chair, Board of Trustees
Rachel Villanueva, MD, FACOG
President, National Medical Association
Board Certified OB/GYN

Panel 2
Moderator: Michelle Aquino, DO
Hospitalist, Baptist Health Medical Correspondent, Action News
NHMA VaccinateForAll Champion
Yvette Calderon, MD, MS
Professor of Emergency Medicine
Chair, Department of Emergency Medicine
Mount Sinai Beth Israel
Hilton Perez, MD, MBA- HA, BS, MT (ASCP)
Chief Clinical Officer, Hoy Health

Panel 3
Moderator: Bertha Hidalgo, PhD, MPH
Associate Professor
Department of Epidemiology
Luis Rosero
Vice President, Corporate and External Affairs
NBCUniversal Telemundo Enterprises
Jorge Neri, Partner
NERI Group
(Consultant, Ad Council)

Register Now
bit.ly/NHAMACOVIDBriefing