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Breastfeeding, COVID-19, and Results from the COVID-Mother's Study

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NYCBLC
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Disclosure

Lori Feldman-Winter, MD, MPH

Has documented no financial relationships to disclose or Conflicts of Interest (COIs) to resolve.

Unapproved or Off Label

-This presentation ***will not*** involve discussion of unapproved or off-label, experimental or investigational use medications or therapeutics.

-This presentation is comprised of ***my own personal*** viewpoints and research and not meant to represent the AAP, ABM or any institution with which I am affiliated.

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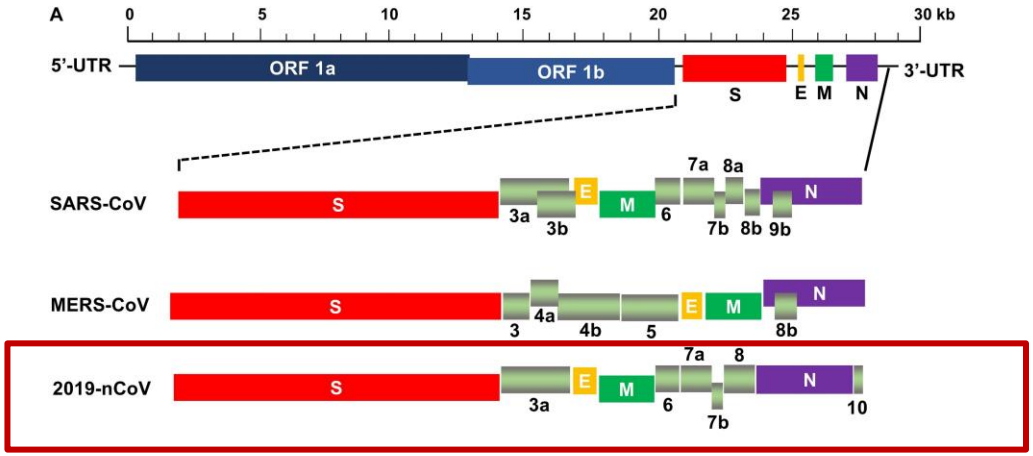
Objectives

1. Describe the biology and epidemiology of COVID-19 among pregnant women and their newborns

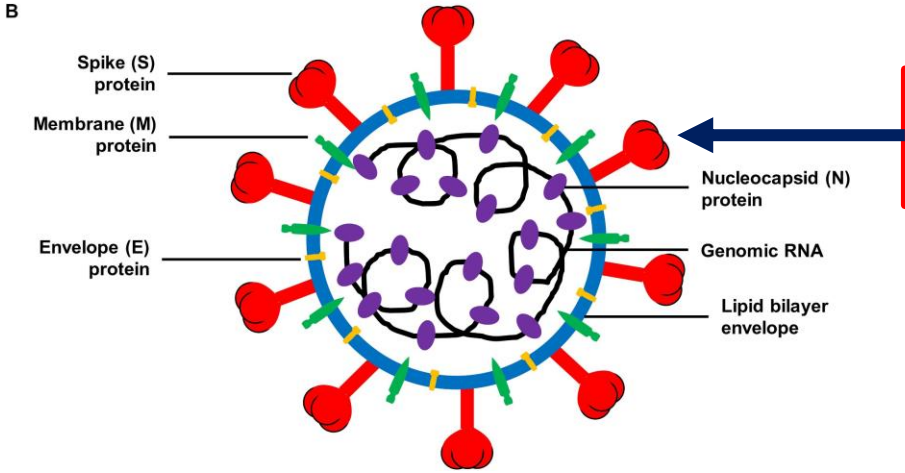
2. Identify how recommendations for COVID-19 positive or PUI mothers affect breastfeeding and viral transmission

3. Develop a strategy of shared-decision making

Genomic structure of SARS-CoV2



(+) ss RNA



Vaccine Target

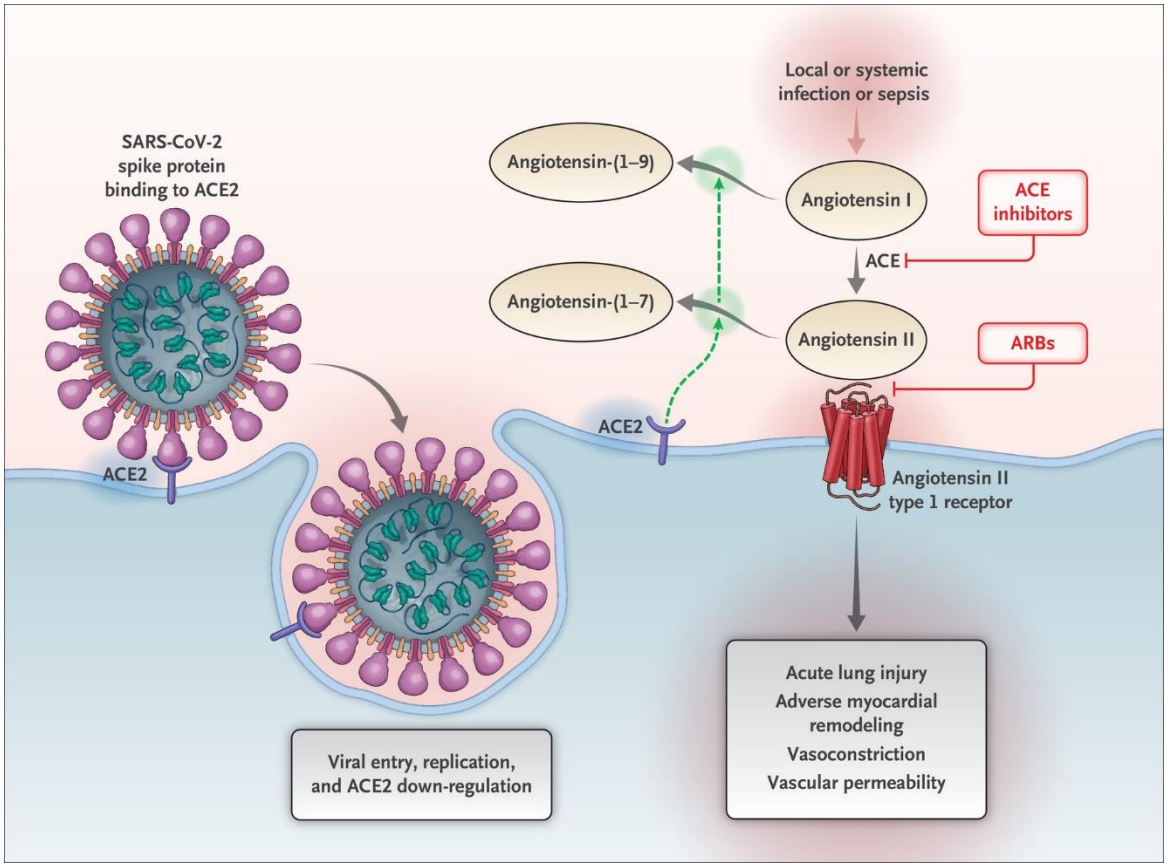
Wang et al. Frontiers in Microbiology. 2020

What do we know about how this virus spreads?

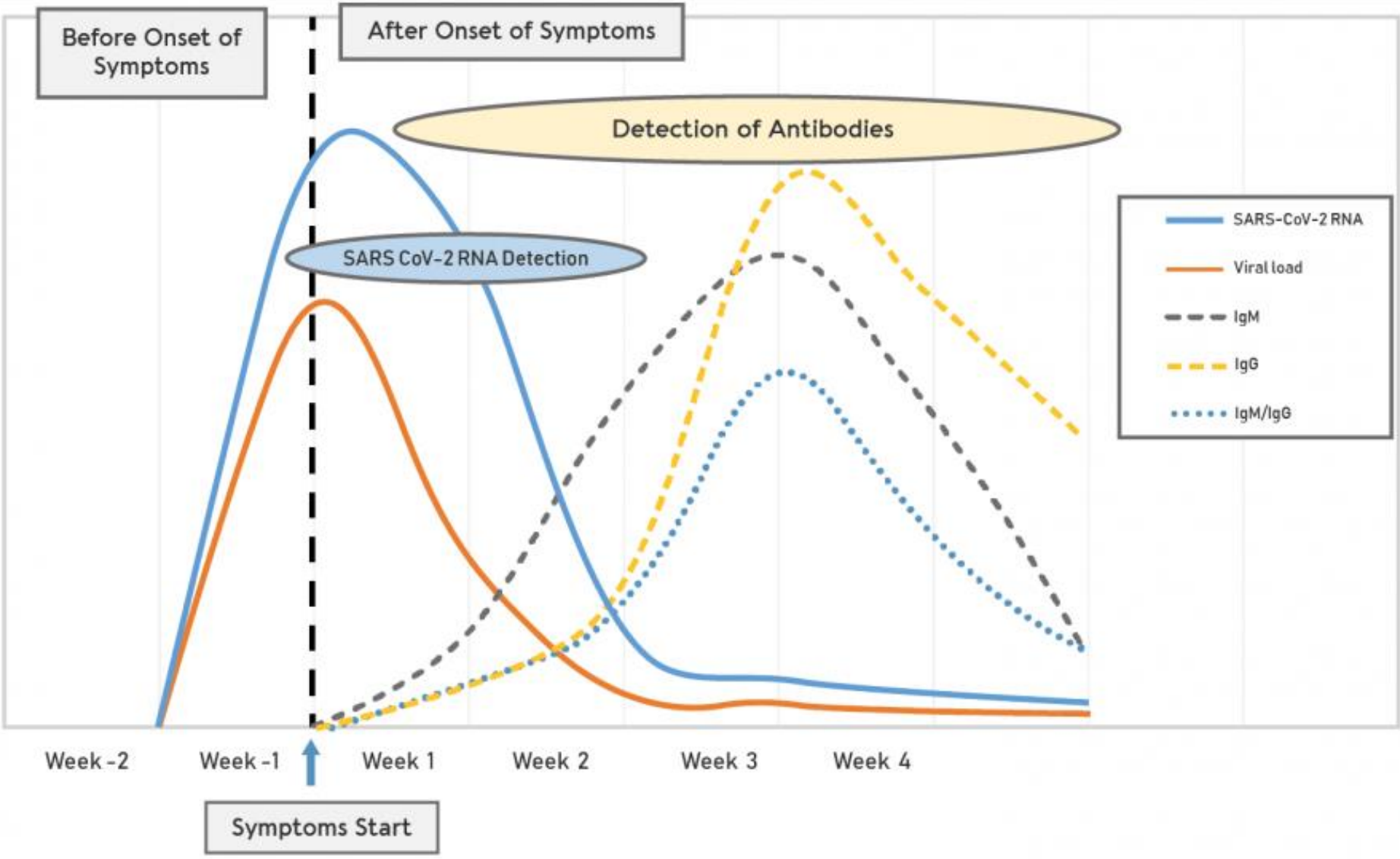
- Advice to keep 6 ft apart based on droplet spread
- Can it spread by aerosolized method? (not measles)
- Probability of getting disease is called the Attack Rate: # people with disease/# people exposed
  - Household contacts 10-40%
  - Sharing a meal with someone 7%
  - Passing person in shopping center <1%
  - OVERALL 5%
  - Healthcare worker in presence of asymptomatic person 3% (unless doing aerosolizing procedure such as intubation, PPV, nebulization, or contact > 2 hours

JAMA interview of Dr. Robert Redfield, CDC

Why Are Children Less Likely to Get Ill?



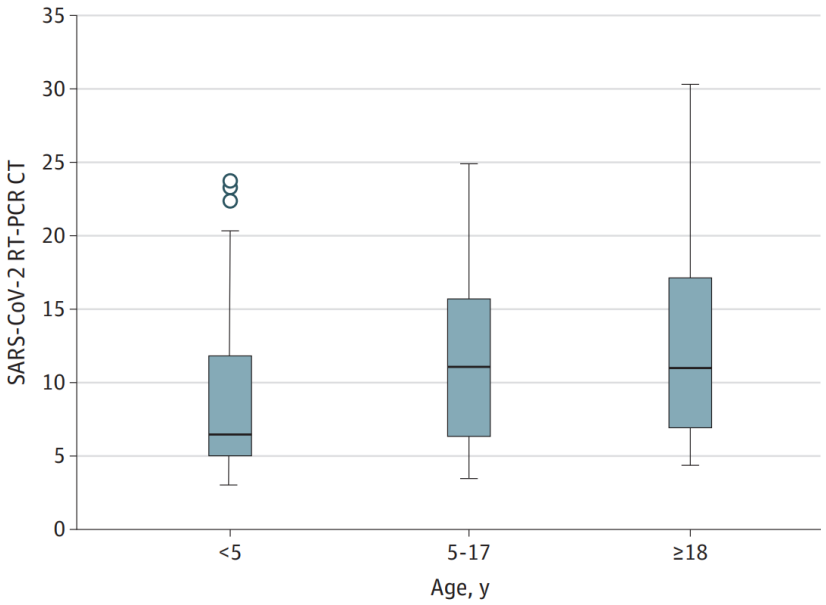
Vaduganathan M NEJM March 2020



https://igenex.com/igenex-covid-19-testing/

Can Children Spread the Infection?

Figure. Distribution of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Reverse Transcriptase–Polymerase Chain Reaction (RT-PCR) Amplification Cycle Threshold (CT) Values From Nasopharyngeal Swabs Collected From Patients With Coronavirus Disease 2019



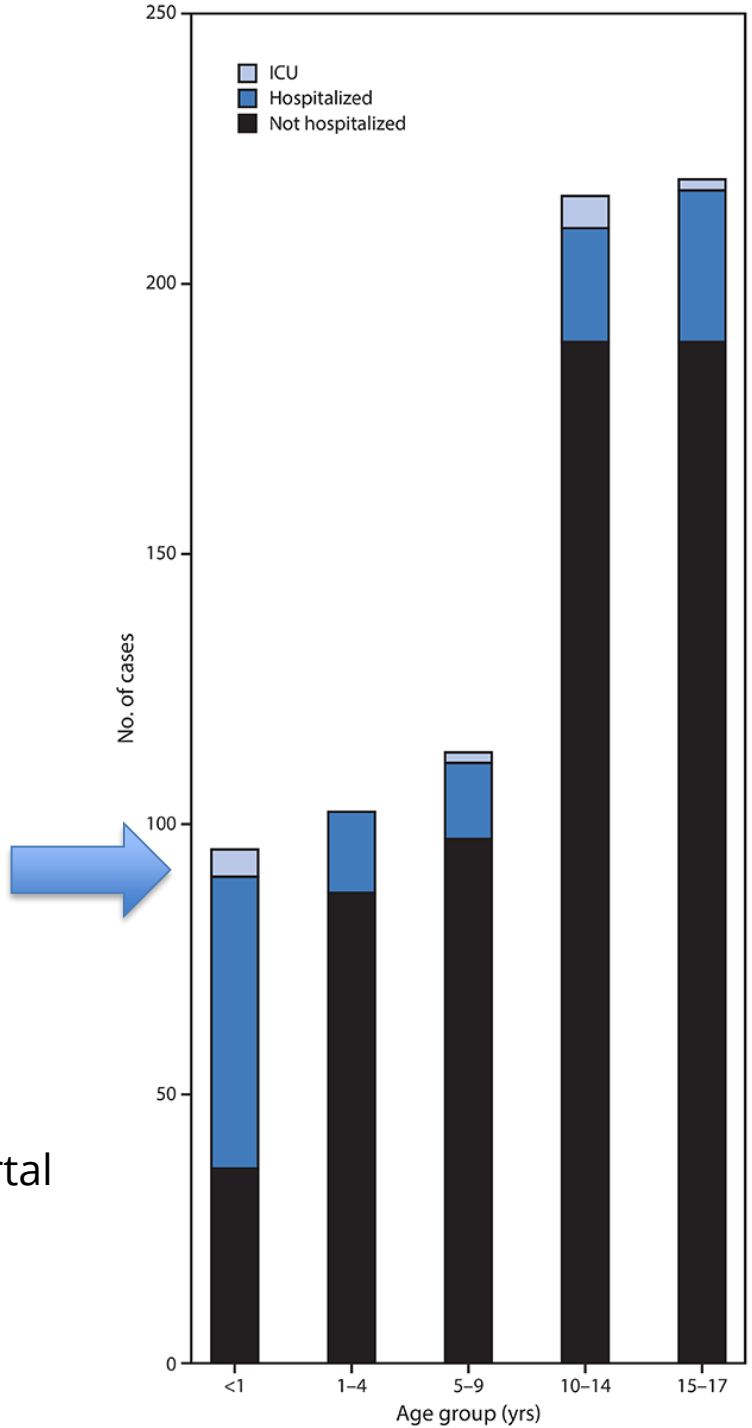
Children younger than 5 years had significantly lower CT values compared with children aged 5 to 17 years (P = .02) and adults 18 years and older (P = .001). CT values were similar between children aged 5 to 17 years and adults 18 years and older (P = .34). Midlines indicate the median, boxes indicate interquartile ranges, whiskers indicate the upper and lower adjacent values (within 1.5-fold the interquartile range), and isolated data points indicate outliers.

- Lower RT-PCRCT means higher viral load
- Children < 5 years of age with mild to moderate COVID-19 may be “super-spreaders”
- Implications for early child care and schools

Heald-Sargent T, et al. *JAMA Pediatr.* .2020.3651

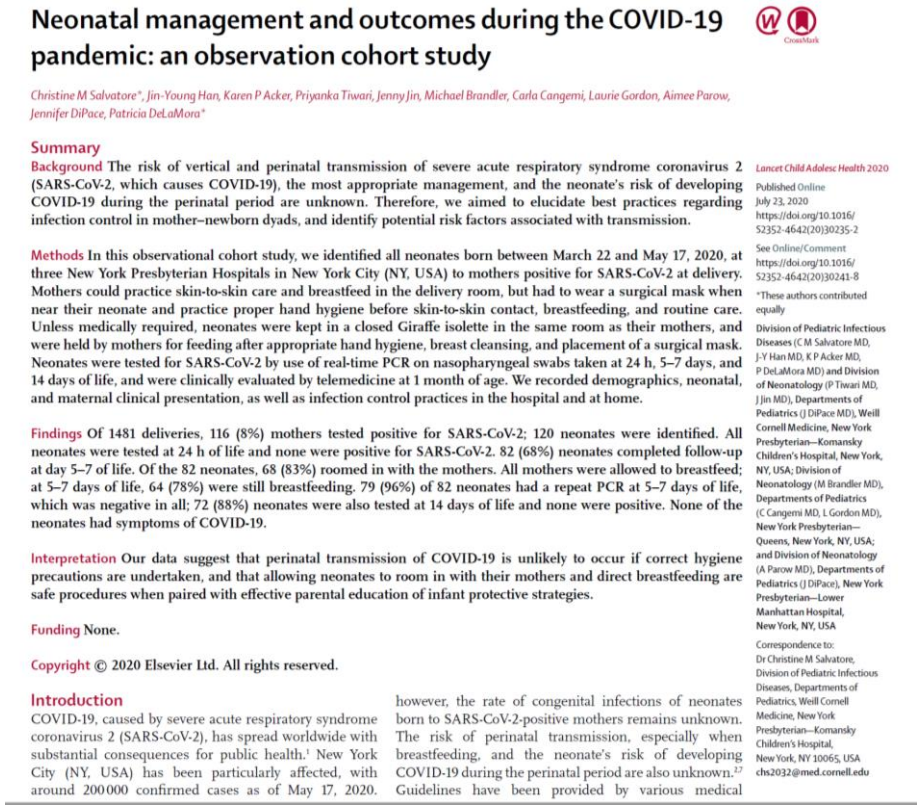
- **COVID-19 cases among children* aged <18 years, among those with known hospitalization status (N = 745),† by age group and hospitalization status — United States, February 12-April 2, 2020**

- †Number of children missing hospitalization status by age group: <1 year (303 of 398; 76%); 1–4 years (189 of 291; 65%); 5–9 years (275 of 388; 71%); 10–14 years (466 of 682; 68%); 15–17 years (594 of 813; 73%).



Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020. MMWR Morb Mortal Wkly Rep 2020;69:422–426.
DOI: http://dx.doi.org/10.15585/mmwr.mm6914e4

What do we know about Perinatal Transmission?



Neonatal management and outcomes during the COVID-19 pandemic: an observation cohort study

Christine M Salvatore*, Jin-Young Han, Karen P Acker, Priyanka Tiwari, Jenny Jin, Michael Brandler, Carla Cangemi, Laurie Gordon, Aimee Parow, Jennifer DiPace, Patricia DeLaMora*

Summary

Background The risk of vertical and perinatal transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2, which causes COVID-19), the most appropriate management, and the neonate's risk of developing COVID-19 during the perinatal period are unknown. Therefore, we aimed to elucidate best practices regarding infection control in mother–newborn dyads, and identify potential risk factors associated with transmission.

Methods In this observational cohort study, we identified all neonates born between March 22 and May 17, 2020, at three New York Presbyterian Hospitals in New York City (NY, USA) to mothers positive for SARS-CoV-2 at delivery. Mothers could practice skin-to-skin care and breastfeed in the delivery room, but had to wear a surgical mask when near their neonate and practice proper hand hygiene before skin-to-skin contact, breastfeeding, and routine care. Unless medically required, neonates were kept in a closed Giraffe isolette in the same room as their mothers, and were held by mothers for feeding after appropriate hand hygiene, breast cleansing, and placement of a surgical mask. Neonates were tested for SARS-CoV-2 by use of real-time PCR on nasopharyngeal swabs taken at 24 h, 5–7 days, and 14 days of life, and were clinically evaluated by telemedicine at 1 month of age. We recorded demographics, neonatal, and maternal clinical presentation, as well as infection control practices in the hospital and at home.

Findings Of 1481 deliveries, 116 (8%) mothers tested positive for SARS-CoV-2; 120 neonates were identified. All neonates were tested at 24 h of life and none were positive for SARS-CoV-2. 82 (68%) neonates completed follow-up at day 5–7 of life. Of the 82 neonates, 68 (83%) roomed in with the mothers. All mothers were allowed to breastfeed; at 5–7 days of life, 64 (78%) were still breastfeeding. 79 (96%) of 82 neonates had a repeat PCR at 5–7 days of life, which was negative in all; 72 (88%) neonates were also tested at 14 days of life and none were positive. None of the neonates had symptoms of COVID-19.

Interpretation Our data suggest that perinatal transmission of COVID-19 is unlikely to occur if correct hygiene precautions are undertaken, and that allowing neonates to room in with their mothers and direct breastfeeding are safe procedures when paired with effective parental education of infant protective strategies.

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Introduction

COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has spread worldwide with substantial consequences for public health.[1] New York City (NY, USA) has been particularly affected, with around 200 000 confirmed cases as of May 17, 2020. however, the rate of congenital infections of neonates born to SARS-CoV-2-positive mothers remains unknown. The risk of perinatal transmission, especially when breastfeeding, and the neonate's risk of developing COVID-19 during the perinatal period are also unknown.[2,7] Guidelines have been provided by various medical

"Perinatal transmission of COVID-19
Is unlikely to occur if correct hygiene precautions are undertaking…. ***direct breastfeeding*** and ***rooming in*** are safe…when paired with effective parental education of infant protective strategies"

What do we know about maternal to Child transmission of SARS-CoV-2 via Human Milk?

- 6 mothers with COVID-19 were studied by Chen et al (Lancet 2020) by PCR of first milk expression; all NEG
- 19 mothers studied by Liu et al (Front Med 2020); al NEG
- Additional smaller studies also no virus found (Fan et al, Clin Infect Dis 2020; Li et al, Emerg Infect Dis 2020; Schwartz DA, Arch Path Lab Med 2020; Wang et al, Clin Infect Dis 2020)
- Three case reports (Buonsenso D et al, Am J Perinatol 2020; Wu et al, BJOG 2020; Gross et al, Lancet 2020) documenting presence of SARS-CoV-2 in human milk; subsequent testing was negative, 1 infant became COVID-positive, but unclear if this was from milk, all infants well

SARS-CoV-2 is NOT transmitted via human milk

- Between March 27 and May 6, 2020, we enrolled 18 women who tested positive by RT-PCR (77.7% White non-Hispanic, mean age, 34.4 years [SD, 5.2 years])
- All but 1 woman had symptomatic disease
- No replication-competent virus was detectable in any sample, including the sample that tested positive for viral RNA.
- 2 samples had been spiked with replication-competent SARS-CoV-2, and following Holder pasteurization, viral RNA was not detected by RT-PCR, and no cultured virus
- However, virus was detected by culture in nonpasteurized aliquots of the same 2 milk-virus mixtures.

Chambers, C., Krogstad, P., Bertrand, K., Contreras, D., Tobin, N. H., Bode, L., & Aldrovandi, G. (2020). Evaluation for SARS-CoV-2 in breast milk from 18 infected women. *JAMA*.

RELEASED IN PEDIATRICS TUESDAY, APRIL 13, 2021

STUDY FINDS NO INFECTION IN BABIES WHO WERE BORN TO SARS-COV-2-POSITIVE MOTHERS AND THEN FED BREASTMILK

- No viral infection identified in babies born to and separated from their SARS-CoV-2-positive mothers at birth and subsequently fed unpasteurized breastmilk.
- 73 newborns of SARS-CoV-2-positive mothers were born in Israel, ***all separated at birth***…
- Published in the May 2021 issue of *Pediatrics* (published online April 13)

NPC-19 Registry

Updated 10/3/20

Inborn/Outborn

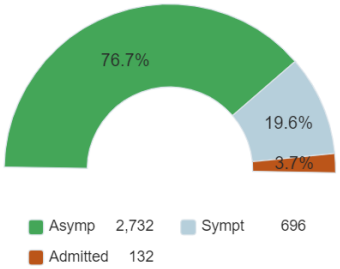


3581 mother/infant dyads

Black	White	Asian	American Indian	Hawaiian	Other
836	1345	147	21	25	1092

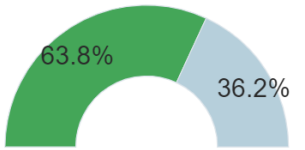
Hispanic	Non-Hispanic
1746	1726

Maternal Status at Admission



COVID-19 Positive	PUI
3219	362

Mode of Delivery



Male: 1846

Female: 1706

Separated at Birth:

Yes: 1511

No: 2037

Infant SARS-CoV-2 Testing:

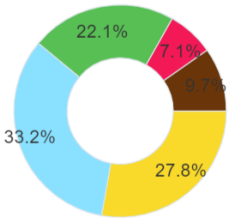
Yes: 3076 (52 Positive in hosp)

No: 486 (19 not reported)

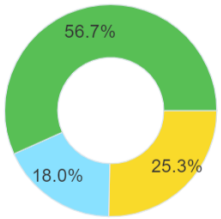
Resuscitation

Oxygen (370) → PPV (461) → Intubation (74)

Isolation



Locations of Care



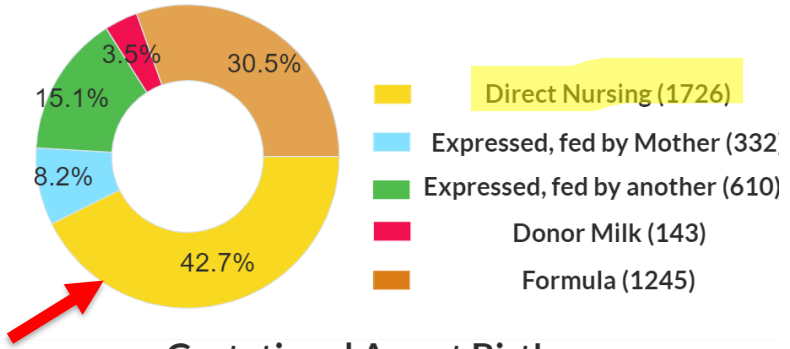
Maximal Respiratory Support



Neonatal Signs



Type of Infant Feeding



Gestational Age at Birth

39 wks (Median) Range: 15-45

Birth Weight

3080 gms (Mean) Range: 482 to 5465

Duration of Hospital Stay

4.82 days (Mean) Range: 0-135

Final Disposition

3495 babies were discharged home, 35 transfers

32 deaths (0 COVID-related), 19 unreported

SONPM COVID-19 Resources:
https://collaborate.aap.org/SONPM/Pages/Perinatal%20COVID-19.aspx

COVID Antibodies in Human Milk

Against the Receptor Binding Domain (RBD)

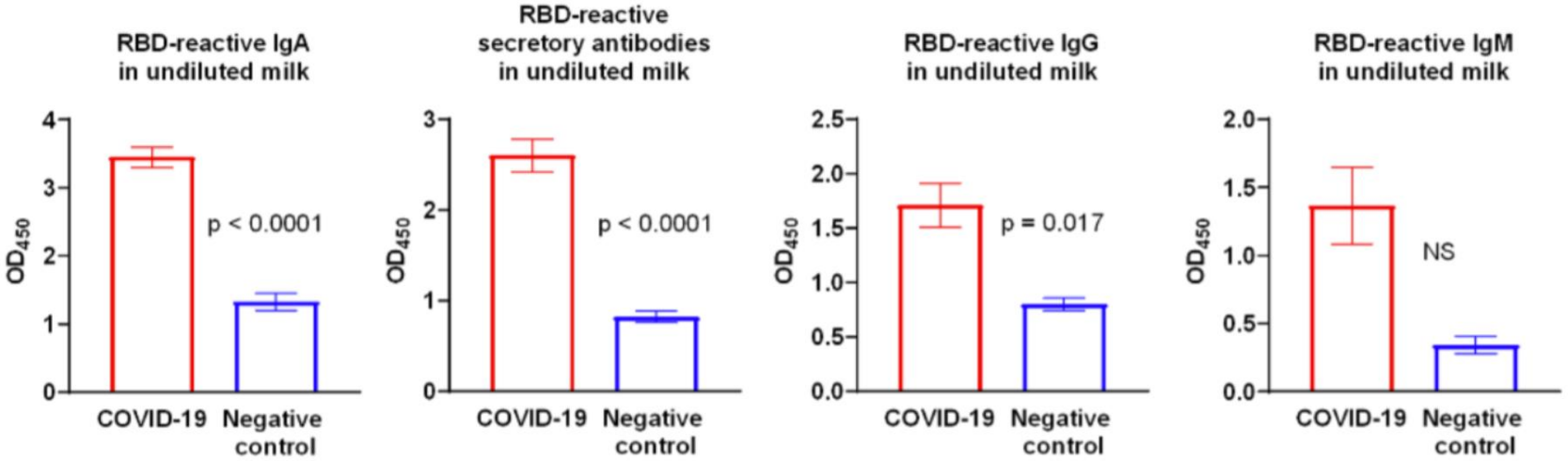


Figure 2 – Optical density (OD) measurements for the reactivity of several antibodies against the RBD show a significant affinity of IgA, IgG, and secretory antibodies in breast milk. Fox et al., 2020

http://sites.utexas.edu/melamed-lab/blog/immunology-of-covid-19/

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Maternal and infant outcomes from the COVID Mothers Study

babycafé USA

HARVARD MEDICAL SCHOOL

unicef ITALIA

ISTITVTO SVPERIORE DI SANITA

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COVID Mothers Study



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Background



- March 2020: Maternity care policies related to COVID-19 were undermining breastfeeding
- Breastfeeding is known to protect against severe lower respiratory tract infect in infants
- Primary Research questions:
  - Are measures to prevent viral transmission to newborns **helpful** or **harmful**?
  - Does breastfeeding protect older infants from COVID?

Study Design



Anonymous survey of mothers, about 8 minutes
Mothers who had COVID and/or their infants who had COVID

Questions on:
Skin-to-skin care, rooming-in, direct breastfeeding
Infant feeding
Separation at birth due to COVID
Maternal and infant symptoms, test results

Survey



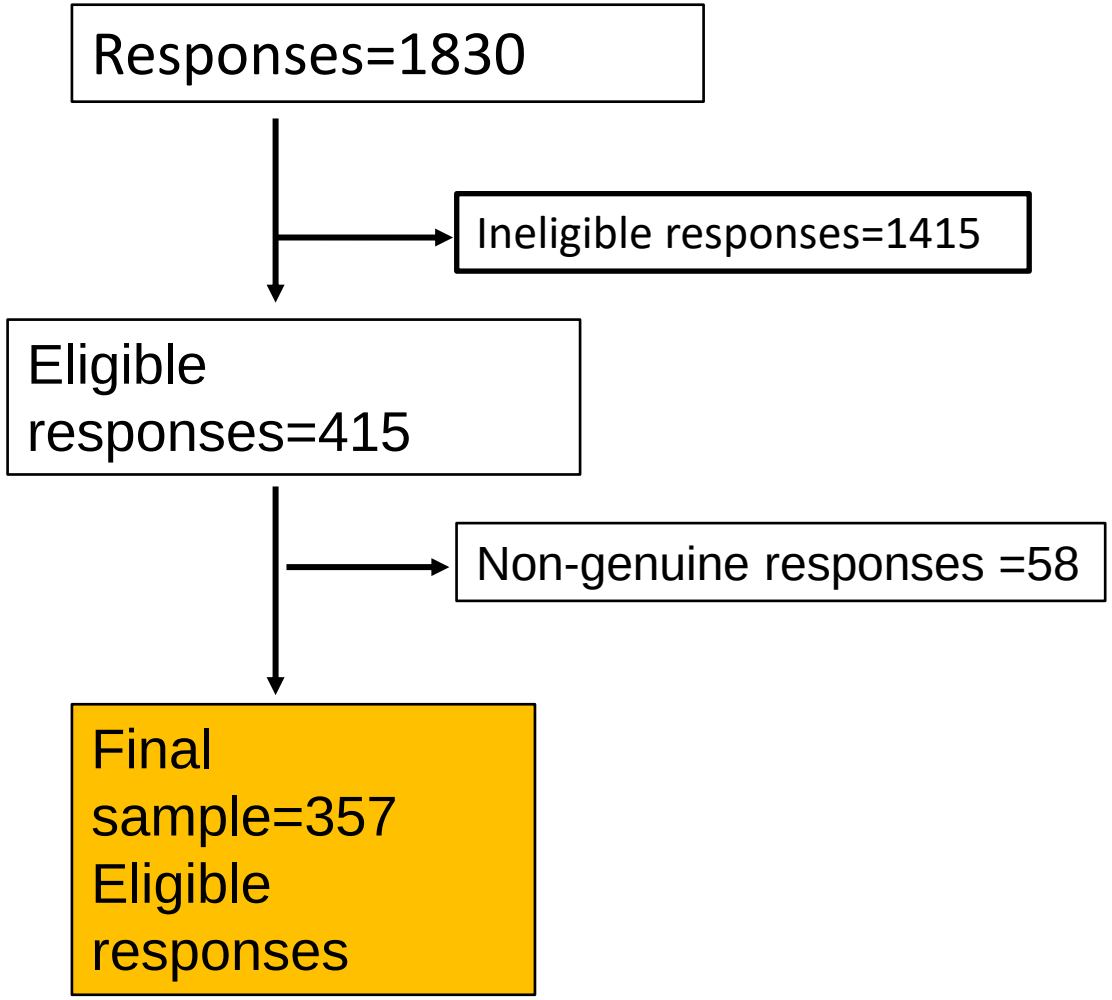
Inclusion criteria:

- Infant <12 months at old at time of infection
- Infant at least 1 month old at the time of the survey
- Biological mother only

Survey ran from May 4 (July 1 in Europe), to September 30

- 3 languages, 7 more eventually added->10 languages
- Recruitment via social media, providers, support groups, word of mouth

Results


Responses=1830
Ineligible responses=1415
Eligible responses=415
Non-genuine responses =58
Final sample=357 Eligible responses

Respondents were from 31 countries:



- North America: (212) 60.0%
- Europe: (88) 24.7%
- Latin America: (69) 19.3%
- Middle East (including Turkey): (9) 2.5%
- Africa: (3) 0.8%
- Asia: (1) 0.3%
- Oceania: (1) 0.3%



Maternal and Infant characteristics



	Neonates (0-30 days) N=129 (36%)	Older infants (1-12 months) N=228 (64%)	Total 357
Infants with SARS-CoV+ /PUI	(45/129) 35%	(183/228) 80%	357
SARS-CoV+ infants of SARS-CoV+ mothers	First 3 days: (6/81) 7.4% First 30 days: (14/99): 14.1%	(43/228) 22%	(58/357) 16%
Infants without infected mothers	0	(6/228) 3%	(6) 2%
Asymptomatic mothers SARS-CoV+	First 3 days: (31/81) 38% First 30 days: (35/99) 34%	(20/218) 9.2%	(59/351) 17%
Asymptomatic infants who were SARS-CoV-2+/PUI	(35/45) 78%	(66/189) 35%	(101/234) 43%
Hospitalized infants who were SARS-CoV-2+/PUI	(4/45) 18% (2 were on ventilators)	(7/189) 4%	(11/357) 3% 6/11 were SARS-CoV-2+ (9/357) 2.5% non-ICU (2/357) 0.6% on ventilators

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Perinatal statistics comparison



	COVID Mothers Study N=81 SARS-CoV-2+ mothers	AAP Registry (US) N=3,581 (3 Oct. 2020)	NYC Elmhurst[1] N=45 SARS-CoV-2+ mothers	Spanish multicenter group[2] N=242 mothers (248 infants)	ItOSS registry (Italy)[3] N=146 mothers (149 infants)
SARS-CoV+ mothers	100%	90%	100%	100% swab or serology	97%
SARS-CoV+ infants	7.4%	1.5%	6.7%	5.2%	6.1%
Symptomatic mothers	62%	23%	40%	60%	72% on admission
Separated at birth	29% (all neonates)	42%	27%	46% (?)	Not reported
Directly breastfed	71% (all neonates)	48%	94%	62%	Not reported

1.Patil, U. P., et al. (2020). "Newborns of COVID-19 mothers: Short-term outcomes of and breastfeeding from the pandemic's epicenter. J Perinatol.

2. Marin Gabriel MA, Reyne Vergeli M, Caserío Carbonero S, Sole L, Carrizosa Molina T, Rivero Calle I, et al. A multicenter study of 242 pregnancies . . . . .month of life. Pediatr Infect Dis J..

3.Maraschini A, Corsi E, Salvatore MA, Donati S, It OSSC-WG. Coronavirus and birth in Italy: Results of a national population-based cohort study. Ann Ist Super Sanità. 2020;56(3):378-89.

Primary outcomes:
Combined outcome of testing+/getting COVID symptoms

Skin-to-skin ≥1 hour after birth compared to removal from mother	**1.44 (0.25, 8.36)**	**0.68**	**Maternal symptoms**
Rooming in at arms' reach, compared to separate room	1.42 (0.26, 7.55)	0.68	Maternal symptoms
Direct breastfeeding compared to breast milk not fed directly	RR: 0.29 (0.06, 1.25)	0.15 (Fisher's exact 2-sided p)	n/a

No significant COVID-related outcomes of these maternity practices on infants.

Primary outcomes:
Maternity practices & risk of hospitalization

Neonates	RR (95% CI)	2 sided Fisher's exact p-value
Skin-to-skin ≥1 hour after birth compared to removal from mother	0.52 (0.05, 4.86)	1.00
Rooming in at arms' reach, compared to separate room	0.22 (0.02, 2.04)	0.23
Direct breastfeeding compared to breast milk not fed directly	0.28 (0.21, 3.92)	0.40

No significant risk of hospitalization from any of these maternity practices.

Secondary outcomes:
Does breastfeeding protect against COVID-19?



Older infants (1-12 months)	OR	p-value	Adjusted for
Odds of infant becoming SARS-CoV+ or getting symptoms by exclusive breastfeeding in first 3 months of life	OR 1.34 (0.26, 7.18) aOR 1.19 (0.07, 19.36)	Unadjusted p=0.87 Adjusted p=0.90	Maternal symptoms

Exclusive breastfeeding is not protective against COVID-19
However– we had too few infants who were not breastfed to adequately assess this effect.

Breastfeeding prevalence



	Diet in the Hospital	Diet in the first 3 months	Diet at 4 thru 5 months	Diet >6 months
Exclusive breastmilk (including expressed, donor)	(86/129) 69.0%	(253/355) 71%	(112/167) 67%	Still breastfeeding (115/118) 97%
Any formula	(41/129) 33%	(102/355) 29%	(55/167) 33%	n/a
Only formula	(18/129) 14%	(6/355) 2%	(5/167) 3%	Not breastfeeding (3/118) 3%

Sample had very few non-breastfed or mostly-formula infants.

Baby-Friendly practices on breastfeeding outcomes
Exclusive breastfeeding in the first 3 months

Infants first 3 months	aOR (95% CI)	p-value	Adjusted for
Skin-to-skin ≥1 hour compared to being taken	2.62 (1.18, 5.78)	P=0.02, p for trend for skin-to-skin= 0.011	Maternal symptoms
Room-in at arms' reach compared to separate room	3.88 (1.78, 8.48))	0.001, p for trend of proximity of mother<0.001	Maternal symptoms
Directly breastfed compared to any milk not fed directly	5.86 (3.02, 11.36)	p<0.001	Maternal symptoms

Maintaining Baby-Friendly practices greatly helps exclusive breastfeeding.

Disruption of norms: adversely effects breastfeeding

Exclusive breastfeeding in the first 3 months

Infants first 3 months	aOR (95%CI)	p-value	Adjusted for
If infant was taken compared to being skin-to-skin ≥1 hour	0.38 (0.17, 0.84)	p=0.02, p for trend for skin-to-skin= 0.01	Maternal symptoms
Infant in **separate room** compared to arms' reach	0.26 (0.12, 0.56)	P=0.001, p for trend for proximity to mother<0.001	Maternal symptoms
Lack of direct breastfeeding (any milk) compared to direct breastfeeding	0.17 (0.08, 0.33)	p<0.001	Maternal symptoms

Disruption of Baby-Friendly practices markedly ***harms*** exclusive breastfeeding.

Additional outcomes:

Combined outcome infant becoming SARS-CoV2+ or getting COVID symptoms

	OR (95% CI)	p-value	Adjusted for
Presence of maternal symptoms in SARS-CoV-2+moms, infants (**any age**) of SARS-CoV-2 + mothers	aOR 4.50 (1.52, 13.29) OR 4.87 (1.66, 14.23)	Adjusted p=0.006 Unadjusted p=0.004	Infant diet in the first 3 months
Presence of maternal symptoms in SARS-CoV-2+moms, infants (**neonates**) of SARS-CoV-2 + mothers	aOR 1.07 (0.18, 6.30)	Adjusted p=0.15	Infant diet in first 3 months
Presence of maternal symptoms in SARS-CoV-2+moms, infants (**older infants**) of SARS-CoV-2 + mothers	aOR 2.38 (0.44, 12.80)	Adjusted p=0.31	Infant diet in first 3 months

Presence of maternal symptoms predicts whether infant tests+ or gets symptomatic COVID-19.

How can symptomatic mothers be more likely to transmit COVID-19, yet maternity practices be safe for newborns?

- Risk of transmission may be greater for older infants than for newborns.
- Newborns less colonized with viruses, breastfed infants even less so.[1]
- There may be some increased risk of transmission, but we did not have the sample size to show it.
- Hospitalization is the ultimate outcome of interest in newborns
  - ➢ This trends toward decreased risk, not increased risk.
- Attention to precautions should be emphasized.

Liang G, Zhao C, Zhang H, Mattei L, Sherrill-Mix S, Bittinger K, et al. The stepwise assembly of the neonatal virome is modulated by breastfeeding. Nature. 2020;581(7809):470-4.

Maternal stress and separation



Separated mothers (n=36)	N=36/125 (29%)
Mothers reporting “severe” distress	(21/36) 58%
Moderate or severe distress	(28/36) 78%
Average length of separation	6-7 days
Separated mothers who tried to breastfeed but were unable, once reunited	(10/34) 29%

Separation caused maternal distress and undermined breastfeeding.

How did the pandemic change practices?

	Older infants (baseline: comparison group)	Neonates (pandemic) 	p-value
Skin-to-skin for ≥1 hour	50%	39%	p<0.001
Infant taken away @birth	14%	29%	p<0.001
Roomed-in within arms' reach	91%	60%	p<0.001
Infant stayed in a separate room	4%	27%	p<0.001
Direct breastfeeding in hospital	95%	71%	p<0.001
Cesarean birth rate	38%	28%	p=0.77

Baby-Friendly Practices less supported over time

Limitations



- Recall and selection bias
- Excluded mothers without smartphones or internet
- No way to verify diagnoses with patient records
- No way to verify genuine responses (e.g., with location)
- Mostly breastfed infants- ? If results similar in non-breastfed infants
- As elsewhere, did not study use of respiratory and hand hygiene, and other methods of reducing spread

Summary: COVID Mothers Study



- Disrupting Baby-Friendly practices may be unnecessary and causes harm by undermining breastfeeding
- Separation of mothers & infants is harmful to both
- Mothers with symptoms may be more likely to transmit virus
  - Ultimate clinical implication is unclear for neonates
  - Attention to precautions is important
- More research is needed with non-breastfed infants

Shared Decision Making: A Conversations Approach

- Engage families at the speed of trust
- Use open ended questions to begin conversations
- Understand what matters most to the mother and the family
- Provide support for decision and help to bring clarity to any misconceptions
- Promote, protect and support breastfeeding



Questions/Discussion