Intrauterine transmission of coronavirus disease 2019

MAJID MAHALLEI MD
NEONATOLOGIST
TABRIZ UNIVERSITY OF MEDICAL SCIENCES
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- Coronaviruses are important human and animal pathogens.

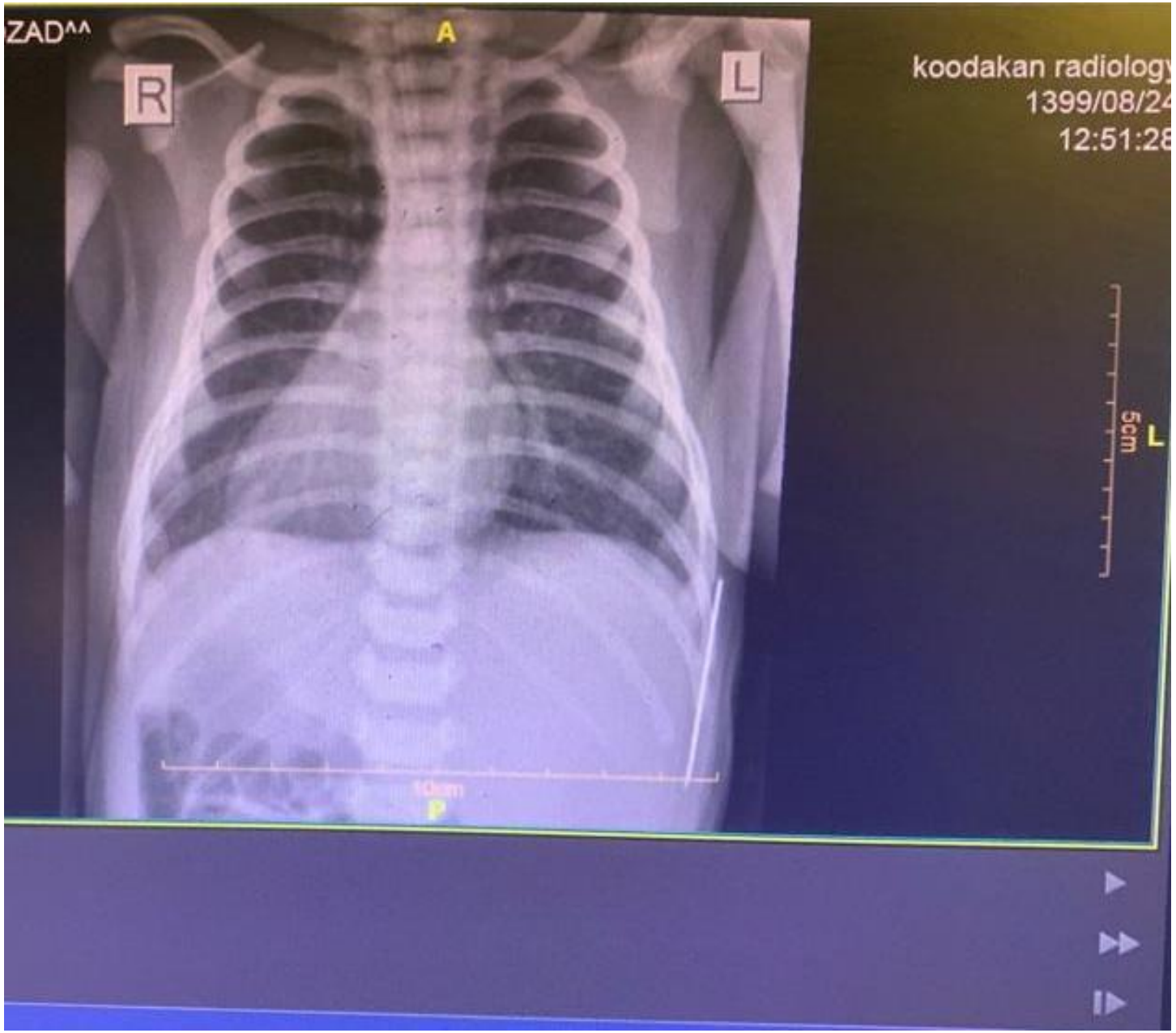
- At the end of 2019, a novel coronavirus was identified as the
- cause of a cluster of pneumonia cases in Wuhan, a city in the
- Hubei Province of China.

- The virus that causes COVID-19 is designated severe acute
- respiratory syndrome coronavirus 2 (SARS-CoV-2);
- previously, it was referred to as 2019-nCoV.

Case Presentation

- A 40-week-old infant born by NVD from a 35-year-old mother (G3P2AL2Ab1) with Apgar scores of 7 in 5 minutes, 9 in 10, respectively, was admitted to the NICU immediately after birth due to respiratory distress.

- After initial stabilization with oxygen, Chest X-ray was advised. There was evidence of dextrocardia in the first CXR and for that patient referred to Tabriz Children's Hospital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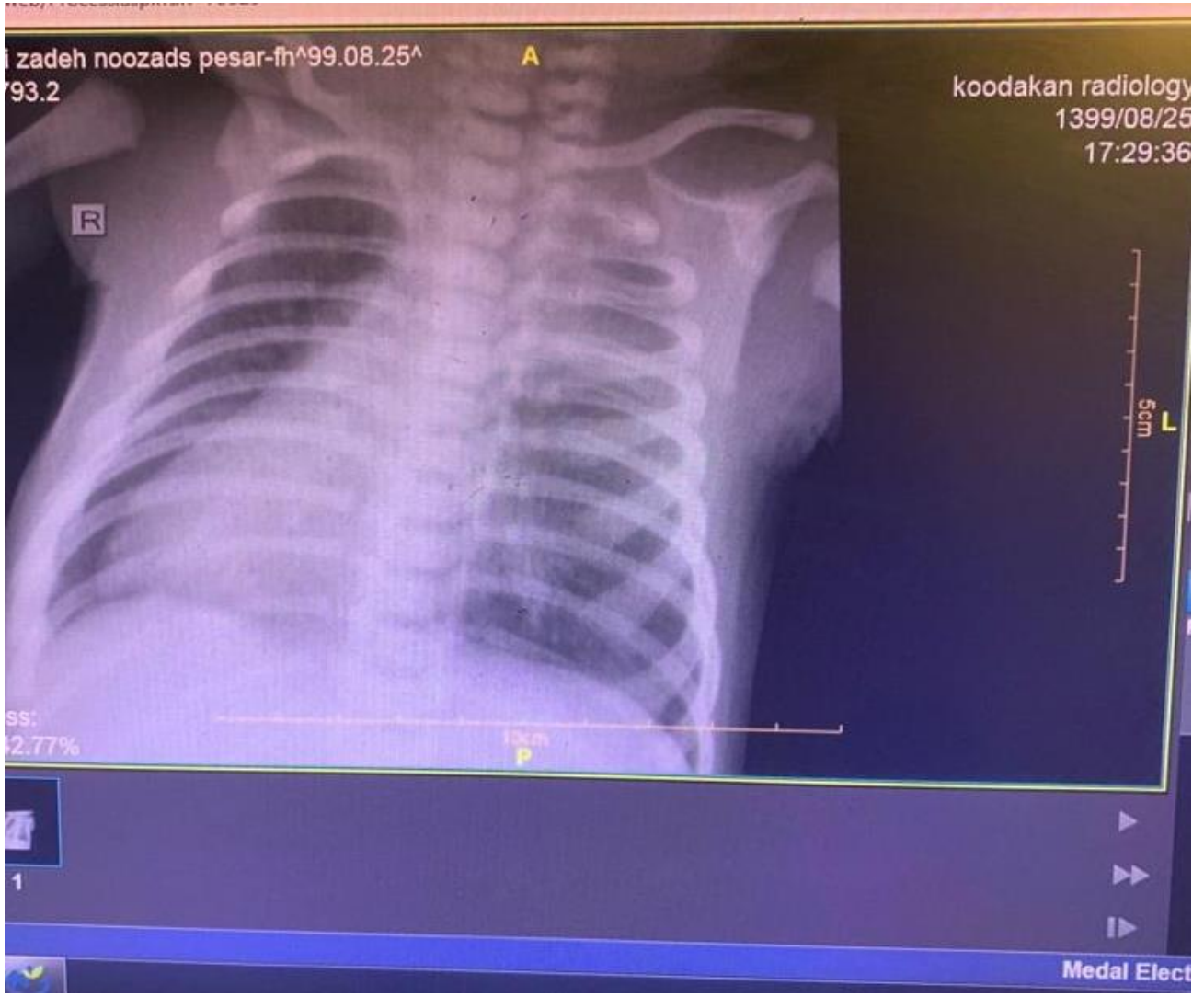
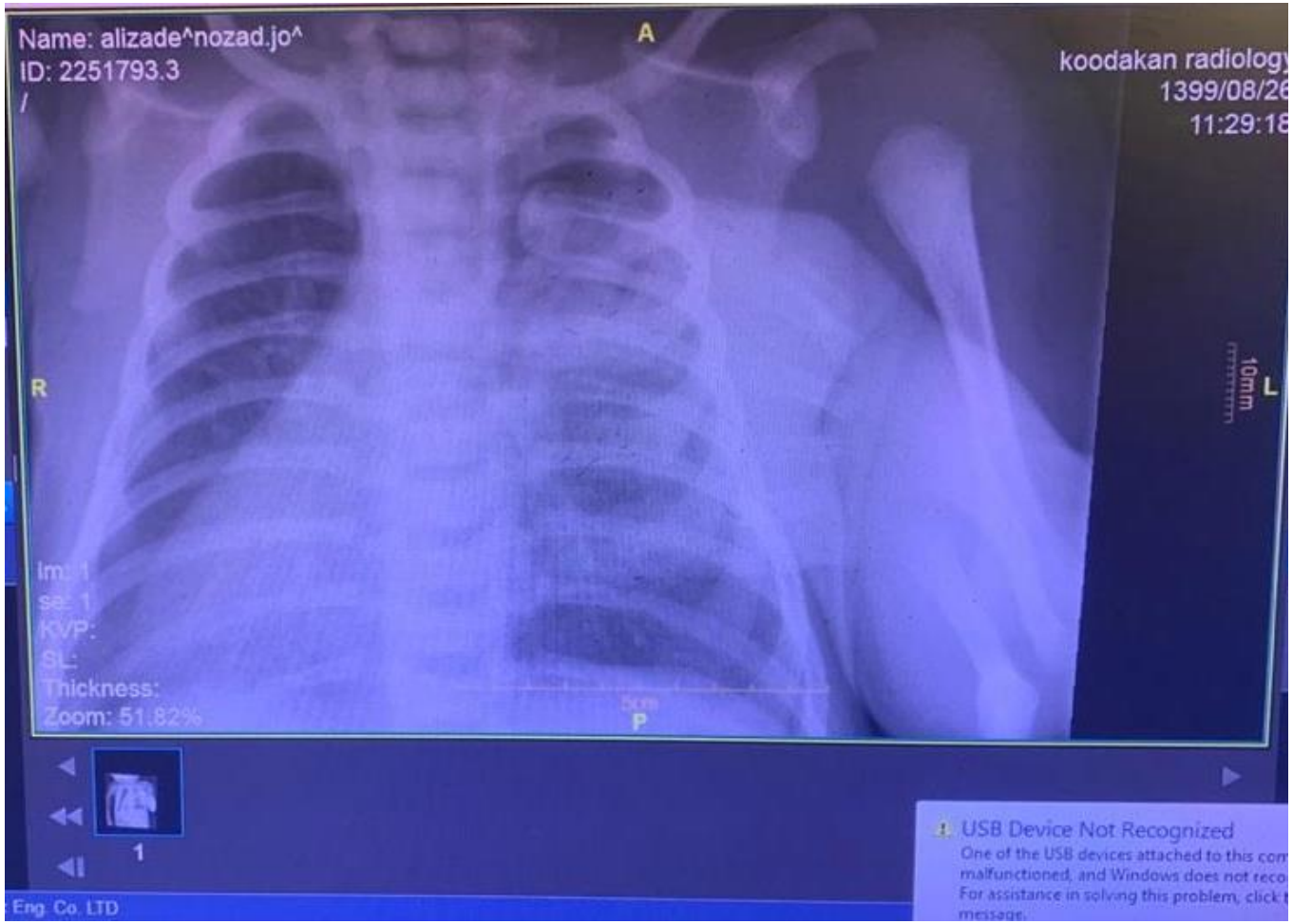
- **The infant was initially treated with NCPAP due to respiratory distress.**
- **Echocardiography showed evidence of ASD, situs-inversus-totalis and dextrocardia.**
- **IVC and aorta on right side with situs-inversus with patent foramen ovale with no significant shunt.**
- **Further, abdominal ultrasound revealed liver and gallbladder located in left hypochondrium, spleen is located in the right hypochondrium and apex of heart is directed on the right side and normal kidneys.**



- **On CXR, the next day, a mild opacity was observed at the apex of the lung**

- **According to the history of the mother, who had COVID-19 symptoms one month before delivery and a positive PCR test, the infant was isolated and a Rt-PCR test of COVID-19 was performed 1n the second day of life.**

- **PCR test of COVID-19 of the baby was positive.**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- **CT-Scan was performed, resulting in complete collapse of the left lingula along with collapse of the posterior segment of the right upper lung lobe with the possibility of COVID**

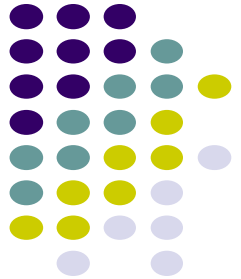
- **CRP of patient checked 3 times in time of admission and were negative.**

- **On admission patient have WBC of 15700 cells/m^3 (with Neutrophil = 9200 and Lymphocyte = 3700 cells/m^3).**

Conclusion

- **The condition of situs-inversus-totalis is a rare case and with a possible vertical infection of COVID-19 in neonate makes this very rare.**

Covid 19 in Pregnancy



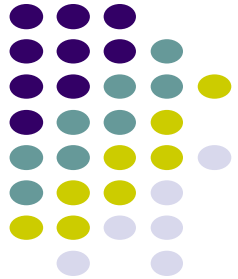
- Pregnant patients are a potentially vulnerable group to COVID-19 infection.

- recent larger cohorts of 116 women in China and 427 women in the United Kingdom suggest that pregnant women are not at an increased risk of spontaneous abortion or spontaneous preterm birth but have higher rates of cesarean delivery.

Vertical transmission

- during the
  - The antepartum and intrapartum periods
  - The postpartum period via the
    - Placenta in utero,
    - Body fluid contact during childbirth, or
    - Through direct contact owing to breastfeeding after birth.

vertical transmission reasons



- The main receptor that COVID-19 binds to enter a cell is the angiotensin-converting enzyme 2 (ACE2) receptor.

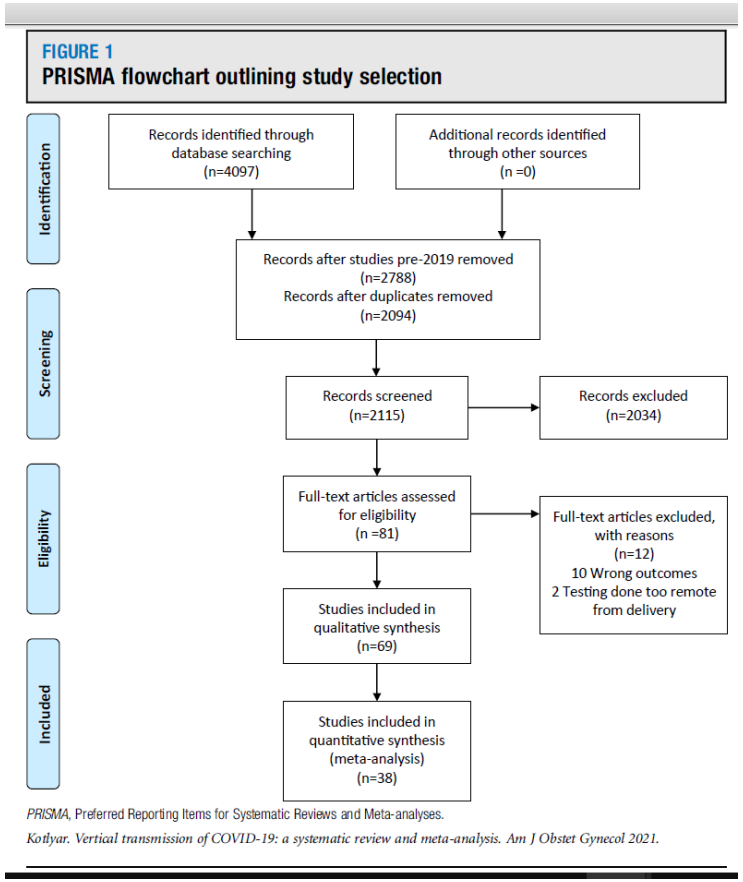
- ACE2 is expressed in the placenta19 and is found in the syncytiotrophoblast, cytotrophoblast, endothelium, and vascular smooth muscle from both primary and secondary villi.20

- A recent systematic review also found evidence that ACE2 is expressed in gynecologic organs such asthe ovary, uterus, and vagina.

- Initial reports from China have documented immunoglobulin M (IgM) antibodies in neonates born to mothers who had positive results for COVID 19 (IgM cannot cross the placenta)

- COVID-19 can infect the placenta as confirmed by the presence of SARSCoV- 2 viral RNA and protein in the placenta and evidence of virions found within the syncytiotrophoblast.

Systematic review: The available evidence regarding the risk of vertical transmission.



PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses.

Kotlyar. Vertical transmission of COVID-19: a systematic review and meta-analysis. Am J Obstet Gynecol 2021.

Eligibility criteria

- (1) the study population included women who had COVID-19 infection during pregnancy confirmed by positive viral SARS-CoV-2 RNA testing;
- (2) the study described results of viral RNA testing for SARS-CoV-2 infection in fetuses or neonates;
- (3) testing for SARSCoV-2 infection was performed within 48 hours of delivery; and
- (4) any study design (cohort, case series, case report).

- Exclusion Criteria
  - Articles that focused on the transmission of COVID-19 outside of the perinatal period

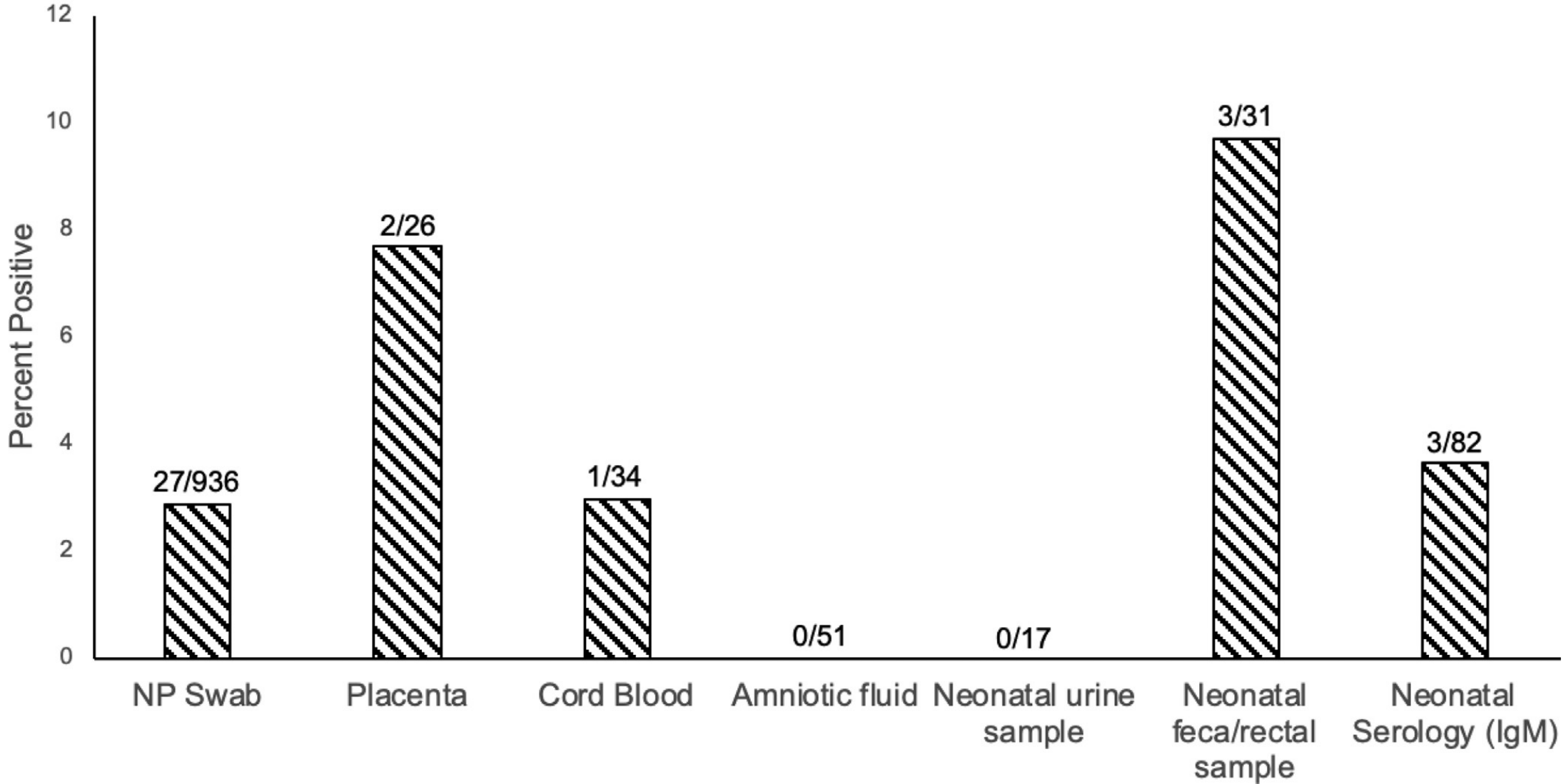
systematic review

- This systematic review included 30 eligible case reports describing a total of 44 SARS-CoV-2epositive pregnant women with outcomes available for 43 neonates

- Data in this review were limited to pregnant women who had laboratoryconfirmed SARS-CoV-2 infection diagnosedby RT-PCR in an NP swab specimen

TABLE 1
Case reports

Author (country)	Number of women	Number of eligible neonates	GA at onset of Sx or diagnosis (range)	Mode of delivery	RT-PCR for SARS-CoV-2					Neonatal serology	Placental histology or EM
					Neonatal NP swab	Placenta	Cord blood	Amniotic fluid	Other fetal sites or tests		
Alzamora et al (Peru)[35]	1	1	33 wk	CD	1/1	None	None	None	None	IgG (0/1), IgM (0/1)	None
Chen et al (China)[36]	3	3	35 wk–38 wk 6 d	CD 3/3	0/3	0/3	None	None	None	None	Chorionic hemangioma (1/3), fibrin deposits in villi interstitium and around the villi (3/3), multifocal infarction (1/3)
Dong et al (China)[25]	1	1	34 wk 2 d	CD	0/1	None	None	None	None	IgG and IgM elevated on delivery day and 13 d later (1/1)	None
Fan et al (China)[13]	2	2	36–37 wk	CD 2/2	0/2	0/2	0/2	0/2	None	None	None
Kalafat et al (Turkey)[37]	1	1	35 wk 3 d	CD	0/1	0/1	0/1	None	None	None	None
Khan et al	3	3	34 wk 6 d	VD 3/3	0/3	None	None	None	None	None	None

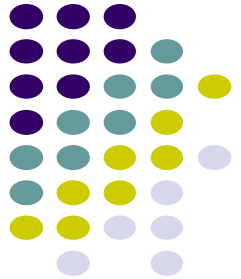

Rate of COVID-19 Infection in Neonates According to testing site
Percent Positive
12
10
8
6
4
2
0
27/936
2/26
1/34
0/51
0/17
3/31
3/82
NP Swab
Placenta
Cord Blood
Amniotic fluid
Neonatal urine sample
Neonatal feca/rectal sample
Neonatal Serology (IgM)

- In this systematic review, we aimed to summarize initial data regarding the risk of vertical transmission of COVID-19

- Given the accumulating evidence from studies vertical transmission of COVID-19 is indeed highly likely.

- maternal COVID-19 infection in the third trimester appears to be associated with low rates of vertical transmission (approximately 3.2%) without significant consequence to the newborns.

numerous questions remain



- These include :
  - whether the virus can cross the placenta in utero and cause an infection in fetal tissues.
  - whether there is a gestational age at which the virus is more likely to infect and cross the placenta.
- if in utero transmission indeed occurs, does the rate of transmission depend on the severity of the maternal disease and does a positive test at birth correlate with the clinical course of COVID-19 in newborns?

Future Studies

- To answer these questions, further larger-scale studies are needed ideally across numerous countries.

Any question?