Maternal, fetal and neonatal outcomes of 5721 pregnancies with COVID-19: A living systematic review

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Last update: October 5, 2020.

The present publication is a living systematic review. It is published as a preprint by DiVA portal (www.diva-portal.org), an institutional repository for research publications and student theses written at 49 universities and research institutions, mostly in Sweden. It is not peer reviewed and I am the sole author.

This systematic review is the base for a peer reviewed guideline in Swedish about COVID-19 (infection with the corona virus SARS-CoV-2), published by www.internetmedicin.se. The guidelines from Internetmedicin are not official but highly regarded and much used – this guideline has been opened well over 100 000 times. My guidelines are compatible with official Swedish guidelines, if they exist. Unfortunately, my English is not revised by a translator.

This is a living systematic review, that is a systematic review that is continually updated, incorporating relevant new evidence as it becomes available (Elliott 2017).

Method

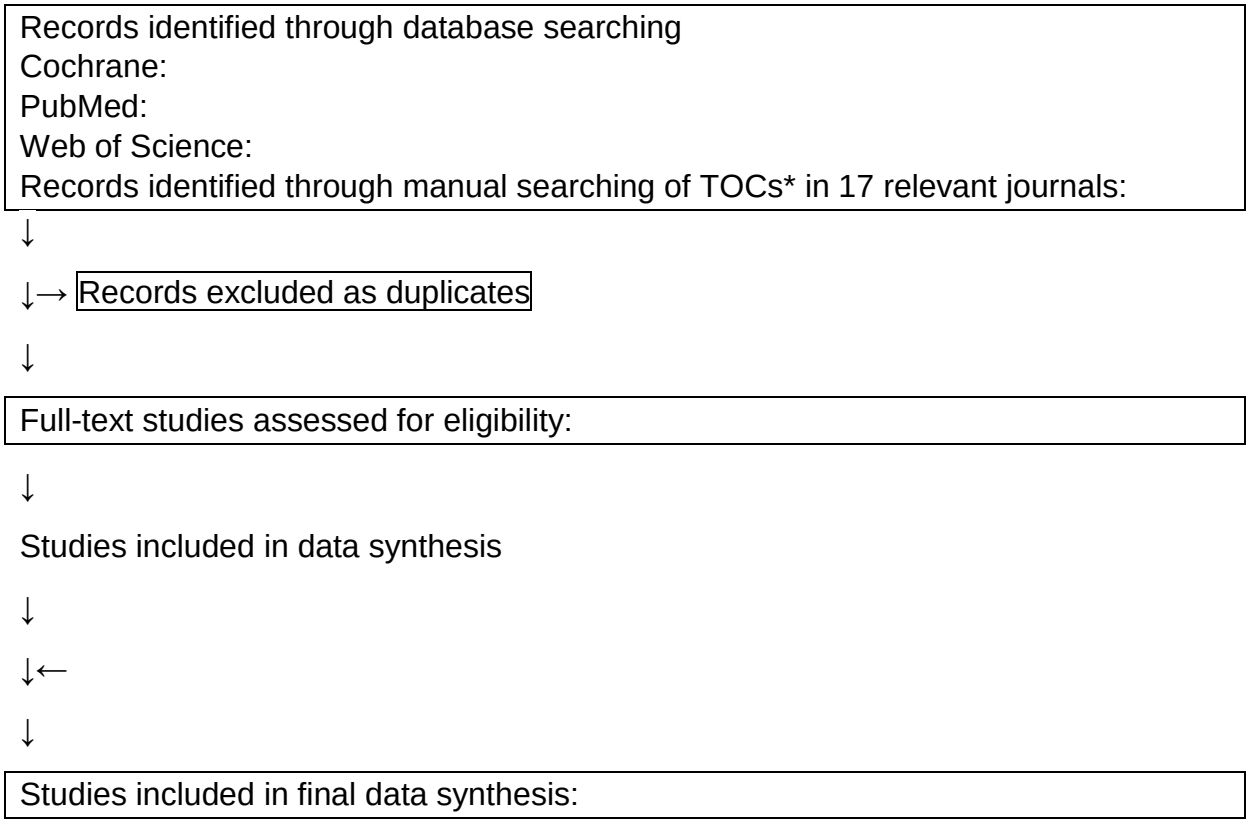
Literature was searched from January 1, 2020, up to August 10, 2020. The Cochrane Library, PubMed and Web of Science were searched for “Covid-19 pregnan*”. Studies that contained clinical data on pregnant women and/or newborn babies (0-28 days old) who became sick or colonized with SARS-CoV-2 were selected for inclusion in my review. The reference lists of the selected studies and of review articles were also searched. Studies in all West European languages were read but for papers in Chinese, only the English abstracts were read, if available.

Exclusion criteria: Studies of radiological diagnosis, anesthesiologic methods, compassionate use of drugs or laboratory findings with few clinical data were excluded.

Tables of contents in several journals were read and searched from 1 January 2020: Acta paediatrica, ADC, AOG, BMC Pediatrics, BMJ, Evidence Alerts, JAMA, JAMA Network Open, JAMA Pediatrics, Journal of pediatrics, Lancet, Lancet infection diseases, Lancet respiratory diseases, Lancet Global Health, Medscape pediatrics, NEJM, and Pediatrics.

Limitations: In systematic reviews, a second researcher independently should check the extraction of data from the study made by the first researcher. Due to time constraints, it was not possible to ask busy clinicians to do this. Therefore, before submitting the manuscript, I reread all cited studies and checked all data in the

tables. The differences between two and one experienced researcher screening literature is, however, usually small (~3%, Mahtani 2020).



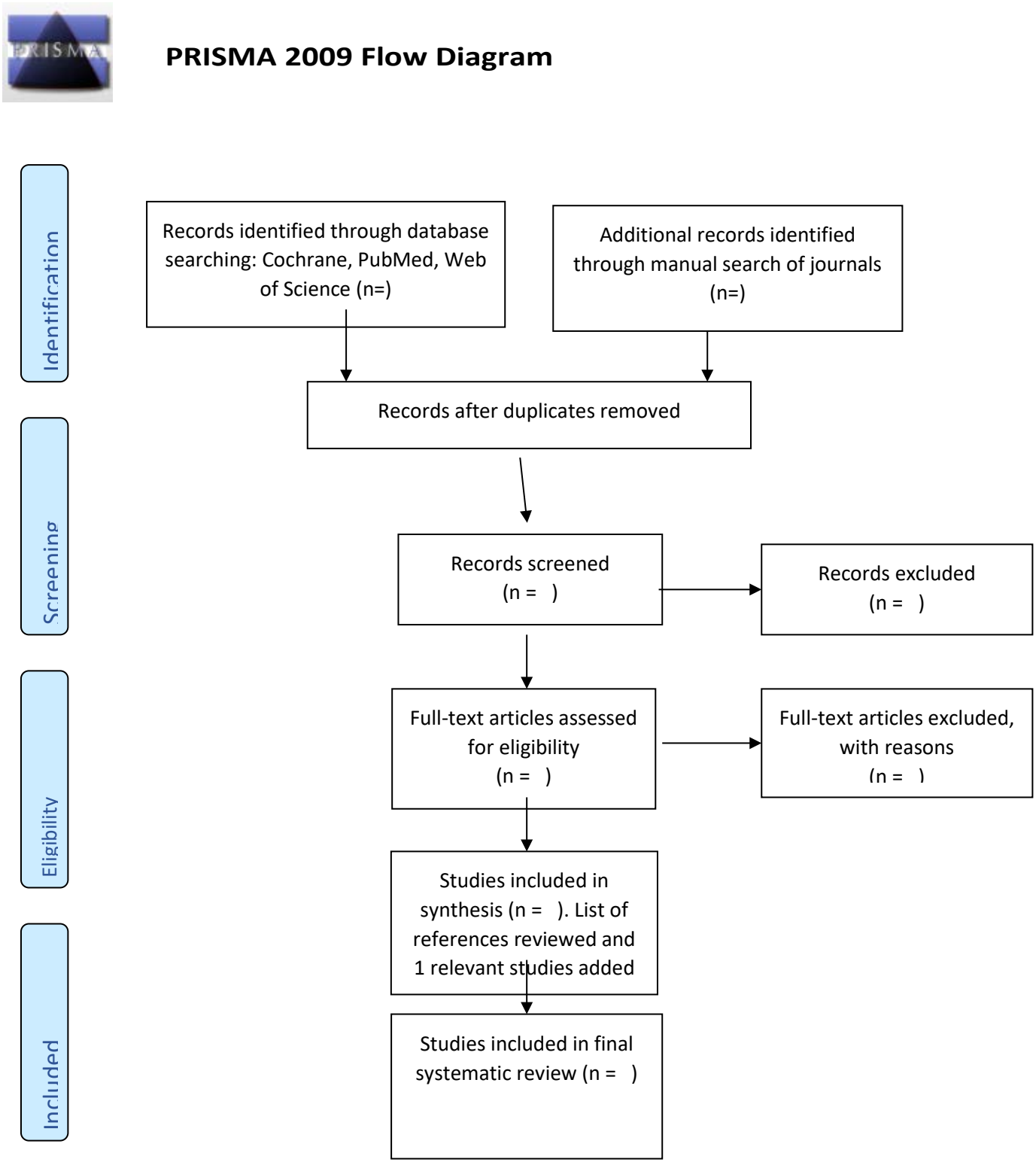


Figure 1. Flow chart of the systematic search process.

Summary of Table 1: Outcome of pregnancies complicated with maternal COVID-19

[figures marked with grey color are not updated]

Studies: 193 studies published from 6 continents. A few of the studies are preprints which were not peer reviewed. The pregnant women had COVID-18, usually diagnosed by PCR but sometimes by CT lungs.

Number of pregnancies: 5721.

Almost all Chinses mothers with COVID-19 had a caesarean section. Vaginal delivery was more common in the Western world.

Maternal deaths

51 mothers have been reported dead in connection with COVID-12 in pregnancy. In the only Swedish case and several other cases both mother and child died. The most common causes of death were acute respiratory distress syndrome (ARDS), multiple organ dysfunction (MODS) and thrombo-embolic disease. COVID-19 in pregnant women is possibly not significantly more deadly than COVID-19 in non-pregnant women. However, the fact that a big share of published cases were from a few months in 2 countries (Brazil and Iran) suggests that there is an underreporting in many countries.

Intrauterine fetal deaths

There were 50 fetal deaths. In one case, the placenta was positive for SARS-CoV-2 (Baud 2020). In addition, 5 medical (legal) abortions and 1 spontaneous abortion were registered.

Neonatal deaths

11 newborns have been reported dead after pregnancy with COVID-19. They were from Brazil (1), China (2), France (1), Iran (2), Sweden (1), the UK (2) and the USA (2). In 6 cases, the authors wrote that the deaths were not directly related to COVID-19 (preterm, asphyxia, MODS). In 9 cases, there were no signs of COVID-19 in the infants; in the 2 cases from the USA there were no data (Delahoy 2020).

The Brazilian newborn died of neonatal asphyxia (Tutiya).

One Chinese boy (35 weeks + 2 days gestational age) died of neonatal asphyxia after being delivered by cesarean section while the mother was in mechanical ventilation due to septic shock. Apgar was 1, 1, 1. (Yan 2020)

The other Chinese boy, born after 34 weeks + 5 days, died when 9 days old of disseminated intravascular coagulation (DIC) and multiple organ dysfunction syndrome (MODS). The mother caught fever 3 days after delivery and the boy became ill the day before his death, with tachycardia, refractory shock and gastric bleeding. The authors didn't mention any treatment except transfusion of blood

components and didn't suggest any diagnosis. They mentioned viremia but it is unclear if it is a finding or a hypothesis. (Zhu 2020)

The French infant died due to prematurity; details were not published (Kayem).

The Iranian newborns were a pair of twins, born with cesarean section after 28 weeks + 7 days of gestation. On their 3rd day of life, they died of complications to their prematurity. They had no sign of COVID-19. The mother, who was >45 years old, died later. (Hantoushzadeh 2020)

As far as we know, the death of a newborn in Sweden has not been reported in any scientific journal and the only thing we know is that the mother was overweight and also died (Tegnell). Since that is the only maternal death related to COVID-19 in Sweden so far, publication of details is probably incompatible with confidentiality.

The death of 2 British newborns were unrelated to COVID-19, according to the report (Knight).

The US newborns who died were born to symptomatic women who required invasive mechanical ventilation (Delahoy 2020). It was not clear from the text if the deliveries occurred during mechanical ventilation.

Vertical transmission

The definition of vertical transmission varies. My definition here is transmission of virus from mother to fetus or infant *in utero*, during delivery or through breastmilk. A classification for the case definition of SARS-CoV-2 infection in pregnant women, fetuses and neonates were released in spring 2020 (Shah PS).

Over 1200 newborns were polymerase chain reaction (PCR) negative in tests for RNA from SARS-CoV-2 (here called PCR-). Most test were from nasal and/or throat swabs but in some cases, tests were also collected from amniotic fluid, umbilical cord blood, breastmilk and placenta; these tests were negative with a few exceptions.

Exceptions were tests from **nasal and/or throat swabs** from 20 newborns collected 24 hours to 18 days after birth. Some of the newborns had breathing difficulties but both mothers and infants recovered without problems. In addition, media reported that a positive test was collected from a newborn in London a few minutes after birth but it was not known if virus had infected the baby *in utero* or in the vagina (Murphy 2020; baby not included in Table).

In a case of intrauterine fetal death (IUFD), PCR tests from **placenta** and mother's nasal swab were PCR+ while tests from amniotic fluid, vagina, newborn's skin, blood, meconium, internal organs were PCR- (Baud, Switzerland). In another case, 3 swabs from the amniotic surface of placenta in proximity to the umbilical cord were PCR+. However, repeated neonatal nasal swabs were PCR- and neonatal blood IgM and IgG were also negative. The newborn was asymptomatic. (Ferraiolo, Italy) These 2 cases were maybe vertical transmissions, maybe not.

A pregnancy in gestational week 22 was terminated to rescue mother's life since she had severe eclampsia with DIC. COVID-19 may have caused eclampsia through infection of the placenta. Umbilical cord, placenta, maternal saliva and urine tested

PCR+. Electron microscopy of the placental region near the umbilical cord showed virus in placental cells, with the appearance of SARS-CoV-2. (Hosier, USA) This case is probably a case of vertical transmission.

A newborn, whose mother had familiar neutropenia, tested PCR+ for nasal swab, placenta, plasma and stool while the mother tested PCR+ for nasal and vaginal swabs, placenta and breastmilk. Microscopy revealed inflammation in placenta. Virus particles were abundant on the maternal side of placenta (cycle threshold, Ct, 13-16) and less abundant of the fetal side (Ct 26-29) but still significant. The authors state that ”[o]ur case represents a probable case of congenital SARSCoV-2 infection” (Kirtsman, Canada). I agree. The mother and son were discharged home 4 days after birth.

In a cohort of 22 newborns born by mothers with COVID-19, 1 newborn had nasal swabs with PCR+ at day 0, 1, 7; another had nasal swabs with PCR- at day 0, PCR+ at day 7. The fetal side of both placentas also tested PCR+. There had been no contact between mothers and newborns after birth. There were no neonatal complications. (Patanè, Italy) These infants could be classified as possible or probable vertical transmission.

In another cohort of 11 newborns born by mothers with COVID-19, 1 placenta tested PCR+ and in 2 cases, membranes (amnion and chorion) tested PCR+. It was not possible to say if the specimens were maternal or neonatal. The newborns showed no sign of COVID-19; no further clinical data were presented. (Penfield, USA)

A mother died of ARDS 15 days after cesarean section. In the newborn, initial throat swab and cord blood were PCR- but amniotic fluid and later throat swabs were PCR+. She was healthy. (Zamaniyan, Iran) It is a possible, but less probable example of vertical transmission.

In the cases above, two were fetal deaths, 3 had no signs of COVID-19 and the other 4 were healthy.

In a German study, a PCR-positive mother’s **breastmilk** was PCR+ for 4 days (quantitative analysis). The newborn simultaneously changed from PCR- to PCR+ and developed breathing problems. Both mother and newborn were soon healthy. (Groβ 2020) Likewise, in a Turkish case, quantitative analyses of breastmilk and newborns’ nasal swab, blood and stool were PCR+. Both mother and infant were asymptomatic (Bastug 2020). These two cases strongly suggest that transmission of SARS-CoV-2 through breastmilk is possible.

Two of 6 newborns delivered by mothers who were moderately ill in COVIR-19 had high titers of **IgM antibodies** for COVIR-19-virus. “M” in IgM means “macro”, i.e. the molecule is not usually transferred from mother to fetus because of its size. Therefore, it is possible that virus has penetrated the fetus and stimulated its production of IgM. This was supported by an increase of interleukin-6 as a sign of infection. The infants were fine with no sign of illness. (Zeng H 2020) Another infant had also high levels of IgM for COVID-19-virus and interleukins 2 hours after birth (Dong L 2020). A newborn suffered severe neonatal asphyxia and was tested for immunoglobulins against SARS-CoV-2 and tested IgG+, IgM+ (Yang H, Hu B, et al.,

China). It is, however, known that interleukins can cross the placenta barrier and there have been false positive IgM values in other congenital infections. The findings by Zeng, Dong and others may therefore be artefacts. (Kimberlin 2020)

Further data is available in Table 1, e.g. (Facchettia F 2020).

Conclusions: Vertical transmission probably exists via placenta and breastmilk but is rather uncommon, usually harmless but sometimes harmful.

Limitations

Risk for duplicated publication of pregnancies is a risk. I have read the studies in full if English text has been available and compared the names and addresses of authors. Studies deleted from Table 1 due to suspicion of redundant publication are collected in Table 2.

Table 1. Outcome of pregnancies complicated with maternal COVID-19

Reference (country)	Number of pregnancies (vaginal/all deliveries)	Gestational age at illness onset (weeks or weeks+ days)*	Complications during pregnancy (in addition to maternal COVID-19)	Deaths in mother or child; complications 0-28d after delivery	Signs of vertical transmission of virus from mother to fetus or newborn; conclusion
Agha R (USA)	5			0/0. Out of 22 children 0-18 years old with nasal swab PCR+, 5 were 11-35d old, with fever without source. Sepsis evaluations were negative; they were then discharged.	No
Ahlberg M (Sverige)	155 PCR+ pregnancies (119/155 = 77%; matched with 604 PCR- pregnancies) . All women in labor were PCR-tested.	Preterm: 9.0%	BMI = 26.5. 10.0% of women born in Middle East or Africa and 3.9% of Nordic women were PCR+. No significant differences in most parameters, e.g. incidence of stillbirth, Cesarean delivery, breastfeeding, low Apgar score.	NA	NA
Ahmed I (UK)	1 (0/1)	29 (CS at 31 weeks)	BMI 35, T2DM.	1(1/0) mother died 6d PP due to pulmonary embolism and basilar artery thrombosis.	Neonatal PCR- (tissue NA)
Algeri P (Italy)	5 (1/5; 6 newborns)	36, 27, 38, 37, 35.	4 cases had pneumonia. Case 2 had urgent CS due to worsening maternal conditions. Case 5 had Bell's paralysis the last week before birth of twins.	0/0. Case 4 needed PP ECMO for 15d; developed Guillan Barré Syndrome. Case 5: maternal PCR NA but lung CT was + and IgG was +.	No. Neonatal throat swabs PCR+: 0/4 at birth and 1 month later. Case 3: normal placenta morphology. **Author's conclusion:** maternal neurological complications are possible.
Alonso Diaz (Spain)	1 (0/1) CS due to preeclampsia .	38+4	Preeclampsia	0/0. Neonatal CPAP for 2h. 2 days PP, the mother got fever	No. Neonatal nasal swabs: first PCR-, after 36h PCR+.

				and respiratory difficulties. CXR: pneumonia. PCR+.	
AlZaghal (Jordan)	1 (0/1) Indications for CS: maternal request and scar after earlier CS.	Term	No	0/0. Apgar 8, 9.	No. PCR-: neonatal nasal swabs x3, breastmilk.
Alzamora (Peru)	1 (0/1)	33 weeks; mother received steroids for fetal lung maturation	Mechanical ventilation of mother who was on insulin for diabetes (BMI 35 kg/m2)	0/0. After CS under mechanical ventilation, the newborn was also under mechanical ventilation immediately because of heavy sedation of mother. nCPAP after 12h.	Yes or no? Neonatal PCR+: throat swab 16h and 48h after CS. IgM and IgG titers for SARS-CoV-2 were negative.
An P (China)	3 (0/3)	38-39	No. 153/166 (92%) of PCR+ pregnant women had mild or asymptomatic COVID-19.	0/0. 1d-5d PP suddenly dyspnea, hypoxia. CT lungs: ground glass signs. All recovered after non-invasive support.	No. PCR-: neonatal throat and anal swabs. **Conclusion:** maternal COVID-19 may cause sudden PP exacerbation.
Andrikopoulou (USA)	158. Number of deliveries not stated.	2 preterm deliveries.	None needed mechanical ventilation. 13% had BMI<25, 51% had BMI≥30. 78% had asymptomatic or mild infection.	0/0.	NA
Aslan MM (Turkey)	12	Mean gestational age: 26 weeks.	No. Mild maternal COVID-19.	0/0	PCR-: vaginal fluid from all 12 mothers during COVID-19.
Badr DA (France, Belgium)	83 pregnant women (≥20 gw) compared with 107 matched non-pregnant women; both groups	NA	Pregnant women had less symptoms than non-pregnant but they were more admitted to hospitals and ICU and more treated with O2 and intubation.	0/0	NA. **Authors' conclusion:** "pregnant women diagnosed with COVID-19 at ≥20 weeks' gestation have more severe outcomes than their nonpregnant counterparts."

	had COVID-19.				
Baergen (USA)	20 placentas from mothers with COVID-19		Fetal vascular malperfusion in 9/20 placentas. The placentas were not analyzed with PCR.	0/0. All newborns were healthy.	No. All newborns had PCR- (tissue NA).
Barbero P (Spain)	91 (11/23) 42 had delivered (38 had COVID-19 during pregnancy, 4 were diagnosed 1-6d PP). 23 had active COVID at delivery.	8/23 were preterm.	Risk factors for hospitalization: obesity, relative old age and Latin-American origin. 4 mothers were admitted to ICU for mechanical ventilation.	0/0. Delayed cord clamping was safely performed.	No. Neonatal nasal swab soon after birth: PCR+ 0/38. Neonatal nasal swab after maternal COVID-19 PP: PCR 1/4. The single PCR+ newborn was probably due to postnatal contact transmission.
Barroso dos Reis H (Brazil)	3 (0/3)	31, 40, 28	All women to ICU. 2 survived, 1 died of MODS.	1/0 All newborns survived.	No. PCR-: 3 neonatal nasal swabs.
Bastug (Turkey)	1 (1/1)	39	No comorbidity. No symptoms.	0/0. Both mother and newborn were asymptomatic and separated after delivery. Expressed breast milk was given to the newborn.	Yes, probably. Maternal PCR+: breastmilk x3 (quantitative), nasal swab. Neonatal PCR+: nasal swab, blood, stool (all quantitative at day 4; nasal swab PCR- at day 0).
Baud (Switzerland)	1 (0/0)	19	IUFD. Obesity. Vaginal birth of a dead fetus 2 days after fever, infection symptoms, nasal swab PCR+.	0/0	Yes? PCR+ tests from placenta and mother's nasal swab; PCR- from amniotic fluid, vagina, newborn's skin, blood, meconium, internal organs.
Berkowitz KB (USA)	10 PCR+ (2% out of 518 tested admitted for delivery)		Comorbidities: 2 BMI>30. 7 asymptomatic.	All deliveries were normal. False positive PCR: NA.	
Blauvelt CA (USA)	1 (0/1)	28	Obesity. ARDS. Improved after CS but mechanical ventilation for 10 days PP.	0/0.	No. PCR-: neonatal nasal, oral, rectal swabs. SARS-CoV-2 IgG-, IgM-.

Blitz MJ (2020a, USA)	82 (compared with 332 nonpregnant females, also with COVID-19).	NA	50/332 (15%) nonpregnant females and 8/82 (9.8%) pregnant females were admitted to the ICU (P=0.22).	NA	NA. **Authors' conclusion:** "pregnant women with COVID19 may not experience more severe disease progression than nonpregnant women."
Blitz MJ (2020b, USA)	13 mothers admitted to ICU (1/6; out of 462 PCR+ pregnant women)		2 mothers died of multiple organ failure. One had BMI<40, the other had ARDS. IUFD in a dying mother.	2/0	Neonatal nasal swab PCR- (7 newborns)
Breslin (USA)	43 (10/18)	Mean: 37.0 (IQR 32.6-38.9)	Mean BMI: 30.9. 14 were asymptomatic.	0/0. All newborns have been discharged.	PCR: neonatal nasal swab 17-, 1 indeterminant.
Browne PC (USA)	1 (on-going twin pregnancy)	COVID-19 at 23 weeks of gestation.	Returned after 9d with contractions which resolved with intravenous magnesium sulfate tocolysis.	0/0 so far.	No. **Authors' conclusions:** "Standard treatment for preterm labor such as intravenous magnesium sulfate" --- "were effective in this patient." --- "infection is not an indication for early elective delivery"
Buonsenso D (Italy)	7 (1 spontaneous abortion, 2 deliveries)	38 and 35	1 preeclampsia, 2 respiratory symptoms.	0/0.	Newborn 1: PCR+ nasal swab 15d (negative at 1d). Mother 2: PCR+: placenta, umbilical cord, breast milk.
Campbell (USA)	30 (20/30)	≥37	770 consecutive mothers admitted for birth were screened with PCR; 30 were +. 22 were asymptomatic, 8 symptomatic.	0/0. Note: If 3% of PCR were false +, the 22 asymptomatic mothers could be false +.	PCR-: nasal swab in all 30 newborns
Cao D (China)	10 (2/10) 11 newborns (1 pair of twins).	4 preterm 33-34 weeks.	Mild COVID-19 in the mothers.	0/0. All mothers had lung pathology on CT after delivery. No neonatal asphyxia.	No. Neonatal throat swab PCR-: 0/5. **Conclusion:** lung CT screening (!) may be necessary during outbreak periods.
Carosso (Italy)	1 (1/1)	37	No	0/0	Yes? Maternal PCR+: nasal and rectal

					swabs, PCR-: vagina, placenta, colostrum. Newborn: PCR+: nasal swab, PCR-: placenta. Cord blood: IgM-.
Chambers C (USA)	(<18 PP mothers)	Breastfeeding mothers with current confirmed or probable COVID-19.	NA	0/0. Infants in age from newborn to 19 months.	No? Breastmilk: 1/64 sample from the 18 mothers was PCR+. Before and after samples were PCR-. The infant was not screened for PCR. No replication-competent virus in any sample.
Chen H (China)	9 (0/9)	36-39	Fetal distress, PROM, hypertonia, pre-eclampsia, influenza	0/0; no complications	No. PCR-: amniotic fluid, cord blood, newborns' throat swabs, and breastmilk from 6 patients.
Chen R (China)	17 (0/17)	3 newborns were born prematurely.	Anemia (5 mothers), gestational hypertension (1), gestational diabetes (2). All 17 mothers were PCR+ and all had ground-glass opacities on chest CT scan.	0/0; no complications for newborns. 12/14 mothers with epidural anesthesia had hypotension. All newborns had 1' and 5' minutes Apgar 9-10.	No. PCR-: nasal swabs x2 from all 17 newborns.
Chen S, Huang B et al. (China), cited by RCOG (2020:2)	3 (NA)	NA	NA	NA	No. Three placentas of infected mothers were swabbed and tested negative.
Chen S, Liao E et al. (China)	5 (3/2)	38-41	Gestational diabetes (2 mothers), preeclampsia (1), fetal tachycardia (1)	0/0; excellent clinical course	No. Probably throat and/or nasal swab.
Chen X (China)	3 (1 legal abortion, 1 current pregnancy, 1 CS)	1st, 2nd and 3rd semester.	No problems	0/0	NA
Chen Y (China)	4 (1/3)	37-39	No	0/0. One child suffered transient tachypnea of the newborn (TTN)	No. PCR-: throat swabs from 3 newborns 72h after

				requiring nCPAP for 3d. All infants and mothers became healthy.	birth; one healthy boy was not tested.
Chen Y, Bai J (China)	21 (5/21)	All were term.	No complications.	0/0	No. Neonatal nasal swab PCR+: 0/21. Pathological lung CT: 0/21.
Choi (Korea)	1 (1/1)	38+6 (admitted when the newborn was 27d old).	No	0/0. Both mother and daughter had mild COVID-19.	Yes? PCR+: maternal and neonatal nasal, throat, saliva and anal swabs; neonatal plasma, urine. The viral loads were ~100 times higher in newborn compared to mother.
Cohen (France)	88 (9/14) questionnaires on Internet to pregnant or puerperal women.	Median term: 27 weeks. 14 newborns: 28-41 weeks.	76% lost smell and/or taste.	0/0	NA
Collin (Sweden)	13 (2/7) pregnant women admitted to ICU		National cohort 1 month 2020. 53 women aged 20-45 years with SARS-CoV-2 in ICU; 13 of them were pregnant or PP (<1 week). RR for pregnant vs non-pregnant: 5.39 (95% CI: 2.89, 10.08).	No death so far.	NA
Cooke WR (UK)	2 (0/2)	28+5, 29+2	Case 1: 39yo Afro-Caribbean primigravidae, BMI=42, T2DM.	0/0	No. Neonatal PCR-. **Conclusion:** prone position after CS improvs oxygenation rapidly.
Cosma S (Italy)	14 (10.1% out of 138 pregnancies)	Diagnosis of COVIS-19 at the first trimester screening (11-13 weeks of gestation).	14/138 were IgG and/or IgM seropositive and/or nasal swab PCR+. No hospitalization for COVID-19.	Pregnancies ongoing.	Pregnancies ongoing.
Costa S (Italy)	2 (0/2)	35, 38		Mother 1: quantitative PCR+ in samples from breastmilk (3/7), cord, placenta.	No, but maternal and cord samples were PCR+ (see left). The newborns were not breastfed.

				No proof of live virus. Mother 2: all samples PCR-.	
Crovetto F (Spain)	125 (14%) antibody+ out of 874 pregnant women.	1st trimester (n=372) or delivery (n=502).	0/125 women to ICU. 75/125 (60%) were or had been asymptomatic.		NA. **Authors' conclusion:** higher seroprevalence (14%) of SARS-CoV-2 compared to PCR-positive rates (0.78%). 0/125 required critical care, compared with the 10% of women diagnosed with PCR.
Dap M (France)	1 (0/1)	37	COVID-19, hypertension, proteinuria. Preeclampsia?	0/0. PP, the mother developed ARDS and was treated with mechanical ventilation and ECMO. Mother and child recovered.	No. PCR-: Neonatal nasal swab. **Authors' conclusion:** preeclampsia is common in COVID-19. Monitor proteinuria in pregnant with COVID-19.
Delahoy MJ (USA, in several states and counties).	598 (302/458= 66%) hospitalized pregnant women with COVID-19. 42.5% were Hispanic (15.3% of women 15-49y in the area were Hispanic; corresponding figures for black were 26.5% vs 19.5%).	12.6% of newborns were preterm.	55% of women were asymptomatic at admission. Pregnant losses: 10 (2.2%) of 458 completed pregnancies. Complications in symptomatic women: pneumonia (29%), ICU admissions (16%), mechanical ventilation (8%). Maternal deaths: 2 symptomatic mothers; no asymptomatic mothers died.	2/2. Newborn deaths: 2/448 (0.4%); both their mothers were symptomatic and treated with mechanical ventilation.	NA. **Authors' conclusion:** "Severe illness and adverse birth outcomes were observed among hospitalized pregnant women with COVID-19."
Demirjian A (UK) (only abstract)	1(0/1)	NA	NA	0/0	Uncertain. PCR- at birth in neonatal respiratory, blood and meconium samples. PCR+ in nasal aspirate at day 3 and fever and coryza at day 5.

De Socio (Italy)	1 (1/0)	40	Mother had minor symptoms of rhinitis, anosmia and dysgeusia.	0/0. Mother and child discharged 2d PP.	No. PCR+: maternal throat swab. PCR-: breast milk and neonatal throat swab.
Dong L (China)	1 (0/1)	34+2 (CS 37+4)	No	0/0	Yes? 2h after birth, the newborn's blood contained IgM for SARS-CoV-2 and cytokines
Dong Y (2020a) China	1 (1/1)	38	Mild symptoms of COVID-19.	0/0	Maternal tests, PCR+: throat, PCR-: breast milk, urine, vaginal secretion, feces, tear, sweat and blood. Neonatal PCR-: throat. Breastmilk contained IgA and IgG against SARS-CoV-2. Authors' conclusion: breastfeeding may protect the newborn against COVID-19.
Dória M (Portugal)	12 (4/10)	10 term deliveries (1 pair of twins, i.e. 11 newborns)	1 mother had headache, the others were asymptomatic. No complications.	0/0. No asphyxia. 8/11 had mild fetal growth retardation.	Neonatal PCR+: 0/11.
Ellington (USA)	16 death pregnant women with COVID-19.		CFR for women with COVID-19: pregnant 16/8207 = 0.2%, non-pregnant 208/83205=0.2%	16/?. Pregnant women with COVID-19 had much more ICU admissions and mechanical ventilation but the same mortality as non-pregnant women with COVID-19.	NA
Facchettia F (Italy)	1 out of 101 placentas (including 15 from PCR+ women), tested + for immunostain for SARS-CoV-2 nucleocapsid .	The investigated newborn was born term.	The mother was PCR+ and had pneumonia and severe thrombocytopenia requiring childbirth induction.	0/0. SARS-CoV-2 viral products and/or particles were detected in villous syncytiotrophoblast, endothelial cells, fibroblasts, maternal macrophages and fetal circulating	Yes. 24 hours after birth, the boy developed pneumonia and severe respiratory distress and was treated with mechanical ventilation. **Authors' conclusion:** proof for intrauterine

				mononuclear cells.	vertical transmission of SARS-CoV-2 infection with sever pneumonia in the newborn. Vertical transmission is uncommon (1/15).
Fan (China)	2 (0/2)	37, 36	No	0/0	No. PCR-: maternal serum, cord blood, placenta tissue, amniotic fluid, vaginal swab, breast milk; neonatal nasal swabs.
Fassett MJ (USA)	17 (0.43% out of 3,963 women screened at delivery)	NA	All were asymptomatic (may have been false positive). "The racial/ethnic composition of our study cohort is similar to that of the overall pregnant population."	NA	No. Newborns delivered by PCR+ mothers were all PCR- 24h after birth (combined nasal and oral swabs).
Federici L (France)	1 (1/1)	Sick at 23 weeks, delivered spontaneously at 33 weeks.	Suspicion of HELLP and preeclampsia. ARDS treated with mechanical ventilation. Recovered. Early termination of pregnancy was considered but not done.	0/0	**Authors' conclusion:** "Fetal extraction should not be systematic in the absence of fetal distress or intractable maternal disease."
Feld (USA)	1 (3 febrile infants; 1 was neonatal: age 28 days; the others were both 43d old)	1 (birth details NA)	NA	Fever, sleepiness, poor feeding, irritable. No respiratory difficulties.	No, not sick until 4 weeks PP. PCR+.
Fenizia C (Italy)	31	NA	NA	Note 1: cord blood can be contaminated with maternal blood. Note 2: this is an interview; I can't find final	Yes? Patient 1: PCR+: placenta, vaginal tract, and maternal blood; in the umbilical cord blood and nasal swab of her infant. Patient 2: IgM and IgG antibodies were

				publication in PubMed.	detected in the mother's blood and in her infant's cord blood.
Ferraiolo (Italy)	1 (0/1) Urgent CS due to CTG pathology.	38+3	Mother had asymptomatic COVID-19.	0/0. Newborn was asymptomatic.	Yes? PCR+: 3 swabs from the amniotic surface of placenta in proximity to the umbilical cord. PCR-: repeated neonatal nasal swabs. Neonatal IgM-, IgG-.
Ferrazzi (2020b; Italy)	42 (24/42) CS were due to (10) or unrelated to (8) COVID-19. No emergency CS.	21-44 (11 premature deliveries).	Pneumonia in 19/42 mothers. 4 mothers were admitted to ICU.	0/0	No? Neonatal nasal PCR+: 3/42. 2 of them were breastfed without mask on the mothers; the 3rd was born vaginally. **Authors' conclusion:** caesarean section should be reserved for women with severe respiratory problems.
Ferrazzi (2020c; Italy)	49 PCR+ (3.1% out of 1 566 pregnant women)	NA	55% of PCR+ were either asymptomatic or had had contact with a person with COVID-19. The problem with false positive samples were not mentioned.	NA	NA
Fontanella (Ireland and The Netherlands)	2 (0/1)	31 and 40	BMI 46 and 40	0/0 (1 pregnancy ongoing)	NA
Forero-Peña DA (Venezuela)	1 (0/1)	38	No	0/0	Neonatal samples: PCR-: nasal swabs x3; blood IgM and IgG for SARS-CoV-2.
Fox NS (USA)	33 (92 suspected COVID-19, 33 confirmed). 1 IUFD.	21 delivered without complication. Gestational week or %CS NA.	2 mothers were treated with oxygen by nasal cannula, 1 at home and 1 at hospital. This was the only hospital admission.	0/0	NA (neonatal PCR was not available).

Futterman (USA)	2 (0/1)	22, 29	1 IUFD. Both mothers had severe COVID-19 with signs of HELLP (hemolysis, elevated liver enzymes, and low platelets syndrome).	0/0	No? The surviving newborn: PCR+ (tissue NA). Authors' conclusion: "the differential diagnosis of HELLP should be considered in women with COVID-19 to avoid iatrogenic preterm delivery, delay in treatment, and complications".
Garcia-Manau P (Spain)	2 (ongoing pregnancies)	22, 20	Maternal COVID-19. Patient 1: bilateral pneumonia, mechanical ventilation, high IL-6 and dimer in serum. Patient 2: milder course. Skin edema in both fetuses; resolved.		No. PCR-: amniotic fluid in both cases. Amniotic fluid had normal levels of IL-6 and samples were negative for several virus, bacteria and Toxoplasma.
Gidlöf (Sweden)	1 (0/1) (twins)	36+2; CS the same day	Severe preeclampsia; gestational diabetes (BMI 38 at first antenatal visit)	0/0	No. PCR+: maternal nasal swab; PCR-: breastmilk, maternal vaginal secretions, neonatal nasal swab.
Gonzalez-Romero (Spain)	1 (0/1)	29; received 2 doses of betamethasone for pulmonary maturation	Mechanical ventilation of mother	0/0; no PP complication for mother or child	NA
Gouez AL (France)	3 (0/3)	NA	Platelet counts (10^9/L) nadir: 94, 79, 40.	NA	NA. **Authors' conclusion:** There is an association of thrombocytopenia and mild COVID-19 (association with severe COVID-19 was known before).
Govind (UK)	9 (1/9)	27-39 (median 39)	Anosmia in 7/9 mothers.	Baby 1: Emergency CS due to maternal hypoxemia. ECMO for mother PP. The baby had PCR+, pneumonia and fever.	Yes? Neonatal nasal swab: PCR+ 1 (baby 1)/9. Baby 1 had intact membranes until CS.

				Recovered. Baby 2: mechanical ventilation for 4d (mother) and 10d (baby).	
Grimminck (Netherlands)	1 (1/1) induced vaginal birth.	38	The mother was on heavy immune-suppressive medication for SLE and hypertension.	0/0. Mother and child left the hospital after 12h. 4 weeks PP: everything was good.	No. Maternal PCR-: throat, vagina, urine placenta. Neonatal PCR-: placenta, throat.
Groβ (Germany)	2 (NA)	Term	The 2 mothers stayed in the same room in the maternity hospital.	0/0 Both mothers and newborns were PCR+ (nasal and throat swabs)	Yes (?). PCR+: SARS-CoV-2 RNA in milk from one mother for 4 consecutive days. Her newborn changed at the same time from PCR- to PCR+ (nasal and throat swabs) and had breathing difficulties but was discharged after 2 weeks.
Hani (Jordan)	1 (0/1)	Term	No	0/0	No. The newborn girl "was tested to be negative for COVID-19".
Hantoushzadeh (Iran)	9 (1/7; two fetal deaths not delivered; 3 pairs of twins = 12 fetuses).	24-38	Critically ill in confirmed (PCR+) COVID-19 in 2nd and 3rd trimester, occurring under a 30 days interval. The 9 mothers were older (average 37y) than average pregnant women in Iran (30y, P<0.001)	7/8. 7 mothers died of ARDS and other cardiopulmonary complications; 1 critically ill, 1 recovered. Fetal and neonatal outcomes: 6 cases of IUFD (including 2 pairs of twins), 2 neonatal deaths (pair of twins, 28+7, PCR-), 4 surviving newborns.	No. PCR-: 5 neonatal nasal swabs including 2 swabs from twins. 1 newborn died later; 1 had pneumonia and nasal swab PCR+ at age 7d.
Hijona Elósegui (Spain)	4 (0/0)	Gestational length at amniocentesis	Indications for amniocentesis: suspected	0/0. The mothers had mild COVID-19.	No. PCR- for amniotic fluid and

		: 16, 16, 21 and 24 weeks.	chromosomal aberrations or viral infection.		vaginal discharge in all 4 fetuses.
Hirshberg (USA)	5 (3 deliveries: 0/3. Indication for all CS: maternal.)	25-31	3 mothers obese. All were on mechanical ventilation for several days.	0/0? 1 newborn had Apgar 2, 4, 4.	No. PCR-: nasal swabs from 3 newborns.
Hong L (USA)	1	23	BMI 42. Mechanical ventilation for 7d. Discharged after 10d in hospital.	Current pregnancy.	NA. **Conclusion:** It is sometimes possible to survive aggressive respiratory support without delivery.
Hosier (USA)	1	22	Severe eclampsia with DIC. Termination of pregnancy to rescue mother's life. COVID-19 may have caused eclampsia through infection of the placenta (see right).	0/1	PCR+: umbilical cord, placenta, maternal saliva and urine. Placental region near the umbilical cord: EM showed virus in placental cells, with the appearance of SARS-CoV-2.
Hu X (China)	7 (1/7) The PCR+ newborn (see right) was delivered by prelabor CS.	37-41	Only mild symptoms.	Deliveries were uncomplicated.	No? PCR-: amniotic fluid and neonatal throat swabs, blood, feces, urine, except 1 throat swab was PCR+ 36h after birth.
Huang W (China)	8 (1/5; 1 pair of twins makes 7 newborns)	28-39	1 mother had septic shock, ARDS, MODS, cardiopathy; 1 had heart and respiratory failure, PROM and eclampsia.	0/2 (1 IUFD, 1 neonatal death of pneumonia). These were born by the severely sick mothers (see left).	Neonatal PCR-: 6 newborns. The neonatally dead case was PCR- but had ground glass opacities on CT lungs.
Iqbal (USA)	1 (1/1)	39	No complication.	0/0	No? "There was no evidence of neonatal or intraamniotic infection."
Juusela (USA)	2 (0/2)	39+3, 34+4	Both mothers developed cardiomyopathy at the end of pregnancy. BMI 45 and 37. At the time of writing the article, both were still in hospital, one in	0?/0	NA

			mechanical ventilation.		
Kalafat (Turkey)	1(0 /1)	35+3 (day 0, first day with symptoms)	Day 1: PCR- (nasal and throat swabs); day 3: US lungs+; day 5:US lungs+, CT lungs+, PCR+, CS due to hypoxemia	NA/0. The mother was still in the ICU at time of writing.	No. PCR-: Blood from umbilical cord, swabs from placenta, breastmilk, neonatal nose and throat.
Karimi-Zarchi (Iran), citing Tasnim Agency	3 (NA)	NA	NA	2/0? two mothers died of ARDS	No. "neonates were negative when tested for COVID-19".
Kayem (France)	617 (94/181) 181 deliveries, 7 pair of twins, 1 triplet make 190 newborns. Mostly 3rd level hospitals.	14 weeks to term. 72% of deliveries were term.	497/617 (81%) were symptomatic. 29 mothers were treated with mechanical ventilation, 6 with ECMO. Risk factors for severe disease: obesity, diabetes, advanced age, hypertension, preeclampsia.	1/1. 7/181 IUFD. The neonatal death was due to prematurity. The maternal death: NA.	No? Neonatal PCR+: 2/90.
Khan (China)	17 (0/17)	35-41	3 preterm deliveries	0/0; pneumonia in 5 newborns	No(?) All 17 throat swabs were PCR– at delivery but 2 swabs were PCR+ within 24 hours. Conflicting data on cord blood analyses.
Khodamoradi (Iran)	1 (0/1)	37	Maternal venous pulmonary embolism 5d PP with lung infarction and COVID-19 pneumonia.	0/0. Mother was discharged in good condition.	NA
Khoury (USA)	245 live births to 241 women (141/241; 6 sets of twins, 2 IUFD).	Preterm: 34/233 (15%)	BMI ≥30: 55%. 17 mothers to ICU; 9 were intubated. 148 mothers (62%) were asymptomatic; 102 remained asymptomatic throughout their delivery hospitalization.	0/0. NICU admission: 61/237 (26%). One maternal cardiac arrest due to COVID-19 pneumonia, which resulted in urgent CS. She remained intubated >2 weeks later.	Probably not. Neonatal PCR+: 6/236 (2.5%). Data of tissue or time of sample NA.

Kirtsman (Canada)	1 (0/1)	35+5	Mother had familial neutropenia and frequent bacterial infections.	0/0. The boy had initial problems with feeding but mother and son were discharged home 4 days after birth.	Yes, probably. Maternal PCR+: nasal and vaginal swabs, placenta, breastmilk. Neonatal PCR+: nasal swab, placenta, plasma, stool. Pathology: inflammation in placenta.
Knight (UK)	427 (national cohort in the UK) (106/156; 78 unassisted vaginal, 28 operative vaginal)	90% were ≥32 weeks	69% were overweight or obese. Black mothers had RR=8.1 to be admitted for COVID-19 compared to white mothers.	7 IUFD. 5 (1%) mothers died, 3 from COVID-19 and 2 from other causes (1 death caused by COVID in 18 000 pregnant women). 2 newborns died; their deaths were not related to COVID-19.	12/265 (5%) of infants were PCR+ (nasal swabs), 6 of them <12 hours after birth.
Kuhrt (UK)	1 (0/1; twins)	32	CS due to abruptio placentae	0/0. Twins were initially intubated. Mother and twins had good outcomes.	No. Neonatal PCR- (tissue NA).
Lee (South Korea)	1 (0/1)	36+2	CS at 37+6 due to obstructed labor	0/0	No. PCR-: nasal swab (x2), placenta, amniotic fluid, cord blood.
Lei D (China)	9 (1/4) Other pregnancies: "One case was terminated at 26 gestational weeks"; 4 pregnancies current.	2 term, 2 preterm	1 mother suffered from ARDS; further data are NA.	0?/0	No. PCR- from 4 cases: amniotic fluid, umbilical cord blood, neonatal nasal swabs, breast milk, maternal vagina.
Li J (China)	1 (0/1)	35	COVID-19 developed into ARDS, MODS and septic shock.	0/1. Emergency CS but infant death within 2h. After that, mother was treated with ECMO for 21d.	NA
Li N (China)	34 (2/34) 18 of them	No data	Significantly increased numbers	0/0 No severe maternal or	No. "COVID-19 infection was not

	were PCR- but CT lung+.		of preterm deliveries; gestational diabetes and hypertension.	neonatal complications.	found in the newborns" but only 3 of them were tested (throat swabs).
Li Yang (China)	1 (0/1)	35	Emergency CS due to fetal bradycardia. No other complication.	0/0	No. Neonatal throat swab, blood, feces, and urine samples were PCR- at 7 different times. On the delivery day, maternal sputum was PCR+ but serum, urine, feces, amniotic fluid, umbilical cord blood, placenta, and breast milk were PCR-.
Liao J (China)	10 (10/10)	36-40	COVID-19 diagnosis based on lung CT; no PCR.	0/0. No problems for mothers or newborns.	Neonatal throat PCR-: 7/7. Lung CT: no pneumonia 7/7. **Conclusion:** vaginal delivery is feasible.
Liao X (China)	1 (0/1)	35	CS due to fetal distress.	0/0	No. PCR-: amniotic fluid, cord blood, placenta, neonatal serum, neonatal throat and anal swabs.
Liang (China) cites anonyme researchers	18 (16/18) (i.e. 16 PN)	NA	NA	NA	No. Methods not specified.
Liu D (China); follow-up by L Li	15 (1/11) 4 mothers still pregnant at follow-up)	12-38 (delivered at 34-38 weeks)	All 15 mothers had mild COVID-19 and recovered	0/0	No. The study says "No SARS-CoV-2 infection was found in the neonates"; methods not specified.
Liu P (China)	51 (3/51)	6/51 35-37, the others were term (preterm <35 were excluded).	27/51 (53%) were asymptomatic. All mothers had chest CT signs of viral pneumonia but only 7 were PCR+.	0/0	No. Throat swabs x3: 51/51 were PCR-.
Liu W, Wang J (China)	19 (1/19)	35-41	10 mothers had PCR+; 9 were diagnosed clinically (including chest CT)	0/0	No. Neonatal PCR-: throat swab, gastric fluid, urine, feces, umbilical cord blood. Maternal PCR-:

					breastmilk, amniotic fluid. Chest CT of newborns were (almost) normal.
Liu W, Wang Q (China)	3 (1/3)	38-40	One fetus had fetal distress and chorioamnionitis. Both PCR and CT of lungs were positive.	0/0	No. PCR- tissues at delivery: placenta, vaginal mucus, breast milk; newborn throat swabs, umbilical cord blood, serum.
Liu Y (China)	13 (0/10) 3 healthy, on-going pregnancies	25-38	5 emergency CS due to fetal distress (3 cases), PROM (1), IUFD (1). The 9 live born babies had Apgar 1' =10.	0?/1. One mother in ECMO at time of publication, after MODS, ARDS and septic shock.	No. No clinical or serologic evidence of vertical transmission of SARS-CoV-2.
Lokken E (USA)	46 (5/8)	Median age 38.4 weeks (IQR 37.5-39.8). 1 CS at 33 w due to BMI>40 and worsening respiratory status.	High prevalence of obesity, asthma, hypertension.	0/1 (7 live births, 1 IUFD). 2 women developed postpartum preeclampsia.	PCR-: placenta of the stillborn child. Other newborns: NA.
London V (USA) (2 patients also presented by Blitz)	68 (33/55) pregnancies with COVID-19 (46 symptomatic, 22 asymptomatic).	9 preterm, all in the symptomatic group, 8 iatrogenic, 7 for respiratory distress. 1 IUFD.	12 symptomatic and 0 asymptomatic mother needed respiratory support (1 mechanical ventilation).	0/0 (1 IUFD, see left).	No. Neonatal nasal swab on day 0: PCR+: 0/48. **Conclusion:** symptomatic mothers needed more medical interventions than asymptomatic.
López-Gatell Ramírez H (Mexico)	2	NA	NA	2/1. 2 maternal deaths; one newborn is healthy. (Source: CNN)	NA
Lorenz N (Germany)	1 (1/1)	40	Mother had respiratory symptom and PCR+ at delivery.	0/0. Newborn had encephalitis symptoms (lethargy, high-pitched cry, hyperexcitable, fever) and nasal swab PCR+. CSF was PCR- and normal. CPAP.	Uncertain. Neonatal nasal and rectal swabs were still PCR+ when symptom-free discharge 14d after birth. The cause of encephalitis symptoms is unknown.

				Later bilateral viral pneumonia.	
Lowe (Australia)	1 (1/1)	40+3	Mother had mild signs of upper respiratory infection.	0/0	No. The newborn was breastfed. Neonatal PCR- at 24h age.
Lu D (China)	1 (0/1)	38	Mother had asymptomatic COVID-19 (tested because of COVID-19 in the family). Chest CT showed a small amount of pleural effusion on both sides.	0/0. No problems.	No. Neonatal PCR-: nasal and throat swabs, blood.
Lucarelli E (USA)	3	23-29	Mechanical ventilation for 3-8d due to pneumonia and respiratory failure and in one case acute kidney injury.	0/0. Mothers recovered after extubation and were discharged.	Current pregnancy. **Author's conclusion:** "Our findings suggest that women with COVID-19 who require mechanical ventilation do not necessarily need to be delivered."
Lyra (Portugal)	1 (0/1)	39	No	0/0. Mother and child were fine, with no problems.	Neonatal nasal and oral swabs: PCR- 0h, 48h and 7d after birth.
Marín Gabriel (2020a; Spain)	42 (22/42)	Mean: 38.	3 women required intensive care; 1 of them died of a massive thrombo-embolism.	1/0. Mechanical ventilation for 2 newborns. Formula fed at discharge: 21/40.	No. Neonatal nasal and/or throat PCR+: 3/42. The 3 PCR+ were re-tested before 24h age: PCR-. **Conclusion:** false positive.
Marín Gabriel (2020b; Spain)	7 (6/7)	38-41	No	0/0	Neonatal PCR+: nasal swab 0/7, hand-expressed colostrum swab 0/7.
Martinelli I (Italy)	1 (0/1)	29	BMI 32. Staph. aureus bacteriemia. Lung embolism. Emergency CS.	0/0.	NA. **Conclusion:** be aware of the risk of lung embolism in obese, pregnant women COVID-19.
Martinez-Perez (Spain)	82 (41/82) CS was significantly associated with clinical deterioration	25/82 were preterm	4 mothers had severe COVID-19 symptoms (all were preterm)	2 CS newborns with initial PCR- developed COVID-19 symptoms and PCR+. Symptoms resolved <48h.	No? Neonatal nasal swab <6h after birth: 3/72 were PCR+; repeat testing after 48h: PCR-. None of these had signs of COVID-19.

				After adjusting for confounding factors, CS remained independently associated with a risk of deterioration.	
Mehta H (USA)	1 twin pregnancy (0/1).	27 (day 0)	ARDS, mechanical ventilation, emergency CS on day 7. Improved immediately.	0/0. Twin A: PCR+ but no signs of infection. Twin B: PCR-, mechanical ventilation.	No? See left. No contact between mother and newborns after birth and before PCR.
Mohammadi (Iran)	1 (NA)	8	Ovarian venous thrombosis (OVT) in a pregnant woman after COVID-19.	Still pregnant. "Initial antithrombotic therapy was considered."	NA
Munk (Norway)	1 (1/1) twins. Induced vaginal birth.	38	No problem. The mother had sore throat and PCR+ before birth.	0/0.	NA
Munoz (USA)	1 (NA)	Birth at 36 weeks	Maternal COVID-19 not mentioned	0/0. 3 weeks after birth, he had nasal congestion, tachypnea and SaO2 87%. CXR: bilateral linear opacities and consolidation. PCR+. Mechanical ventilation for 5d.	Unlikely. The boy became sick in COVID-19 at home. Rout of transmission probably horizontal. PCR was also + for rhinovirus.
Nawsherwan (China)	7 (0/7)	3 were preterm	No severe complication to COVID-19.	0/0. The 3 preterm had Newborn Respiratory Distress Syndrome; 2 were treated with non-invasive ventilation.	No. PCR-: 7/7 (tissue NA).
Ng (UK)	1 (0/1)	34		0/0. 5d after birth, she came back to the hospital with lethargy, hypothermia and apnea. nCPAP and 30% O2. CXR: Increased opacity in both lungs.	No? Tested + for SARS-CoV-2 and seasonal coronavirus. The authors: probably postnatal infection.

				Discharged after 8d.	
Nie (China)	33 (5/27; 28 newborns) 5 ongoing pregnancies, 1 induced abortion.	18/28 term	29/33 had oxygen supplementation. 1 mother had non-invasive ventilation. None was in ICU.	0/0. 1 newborn (born after 34 weeks gestation) had ARDS but recovered.	No? For 26 newborns, throat swabs were tested; 1 was PCR+ 36h after birth. Asymptomatic and PCR- for cord blood and placenta but CXR was consistent with pulmonary infection. Recovered.
NVOG (The Netherlands)	150 (25/41) 150 (108+41+1) pregnancies were confirmed CONVID-19. 108 were still pregnant, 41 had delivered, 6 had been in ICU (8 May 2020). (Miscarriage: see right.)	1 premature newborn.	1 IUFD. The most frequent complaints: fever 61%, cough 76%, shortness of breath 42%. 18 women received oxygen therapy.	0/0. 9 newborns were treated in NICU but were not seriously ill.	No: "Neither neonate was tested positive for COVID-19." PCR+: maternal vaginal secretion PP (1 case).
Oliva M (USA)	1 (0/1)	29 (CS at 30+5, after a single dose of betamethasone for fetal lung maturity 24h before birth).	CXR: extensive patchy airspace opacities. CS without intubation led to an immediately decreased oxygen requirement.	0/0	No. Neonatal nasal swab PCR- at 2h and 3d after birth.
Panagiotakopoulos L (USA)	105 (65/93) hospitalized pregnant women with COVID-19 (93 delivered).	GA at diagnosis of COVID-19: 38w, range 12–41w. GA at delivery: median 39w, range 31–41w.	62% of women were Hispanic. Admitted to ICU 14/105, sepsis 16/105, ARDS 6/105, mechanical ventilation 7/105, maternal death 1/105 (due to COVID-19). Stillbirths: 3. 62 were admitted for obstetric reasons; 50 of them (81%) were asymptomatic.	1/0	NA. **Authors' conclusion:** obesity and gestational diabetes were risk factors for serious course of COVID-19. There were increased % of preterm delivery and stillbirth.

Panichaya P (Thailand)	1 (Down´s syndrome)	18 weeks. After 27 days: legal, medical abortion.		0/1	No. PCR-: placental swab, fetal nasal and throat swabs. Placenta histology: no inflammation.
Patanè L (Italy)	22 deliveries by PCR+ mothers. 2 PCR+ newborns (see right): (1/2).	The two PCR+ newborns: 37+6, 35+1	No	The two cases: 0/0. No neonatal complications.	Yes? Neonatal nasal swab: case 1 PCR+ at day 0, 1, 7; case 2: PCR- at day 0, PCR+ at day 7. Both placentas, fetal side: RNA+ from SARS-CoV-2. No contact between mothers and newborns.
Penfield (USA)	11 (7/11)	26-41	3 critical, 2 severe, 6 mild COVID-19. PCR+ (see right column) were from critical and severe cases.	0/0. The newborns showed no sign of COVID-19; no further clinical data.	Yes? Placenta: 1 PCR+, 10 NA; membrane (amnion and chorion): 2 PCR+, 8 PCR-; neonatal samples: 11 PCR-. It was not possible to say if PCR+ were from maternal or neonatal tissues.
Peng (China)	1 (0/1) (35+3)	34+3	No	0/0 (CPAP 0-5d, surfactant; recovered fully)	No. Maternal PCR- tests x10 from amniotic fluid, vagina, cord blood, placenta, anal swabs, breast milk; neonatal PCR- tests x6 from anal and throat swabs, serum, sputum, urine.
Pereira (Spain)	60 (23 delivered: 18/23)	2 preterm	2 preeclampsia, 1 HELLP (low platelet syndrome)	0/0. 21 newborns were breastfed, 2 were in NICU (RDS, hemolytic anemia).	No. PCR-: nasal swabs from all 23 newborns 2h after birth, and placenta from 6 newborns.
Perlman J (USA)	31 (9.5%) mothers were PCR+ out of 326 deliveries.	2 preterm births.	15 (48%) mothers were asymptomatic and 16 (52%) were symptomatic.	0/0. The preterm newborns were treated with CPAP. All term newborns were admitted to the well-baby nursery and discharged home with their	No. All newborns were PCR- (nasal swabs? x2-3).

				mothers after 24-48h.	
Pierce-Williams (USA)	64 (32 delivered: 8/32)	Mean 30 weeks; 35 weeks at delivery.	44 had severe and 20 critical COVID-19. Mean BMI=34.	0/0 (33 newborns; 1 pair of twins).	No. 1 newborn had PCR- at 24h but PCR+ at 48h, with no signs of disease.
Prabhu M (USA)	70 PCR+ (out of 675 women admitted for delivery) (38/70)	Mean 39 weeks.	15/70 were symptomatic, 55/70 (79%) were asymptomatic at presentation but 20 of them had symptoms before or after. 3 had hypoxia; 3 were readmitted for PP pneumonia. None needed mechanical ventilation.	0/1. 1 IUFD. 70 mothers delivered 73 newborns. Several placentas had thrombi in the fetal vessels.	Neonatal nasal swab PCR+: 0/71 (2 newborns were not tested).
Pulinx B (Belgium)	2 (one pair of dichorionic diamniotic twins)	2 IUFD in week 24.	COVID-19 could be cause of the demise; no other known disease in the mother.	0/2	Yes, probably. PCR+: placenta, amniotic fluid, maternal blood. PCR-: both amniotic sacs. Microscopy of placenta: extensive intervillous fibrin depositions and ischemic necrosis of the surrounding villi; virus in the placental syncytiotrophoblast cells.
Qadria (USA)	16 (8/10)	NA	11/16 mothers were African-American. BMI 26-43. 2 mothers received a short treatment of O2 by nasal cannula.	0/0	No. Neonatal PCR- (nasal swab?).
Rabice (USA)	1 (0/1)	33	Diabetes mellitus type 1. BMI=44. Acute pancreatitis.	0/0	NA
Sahin D (Turkey)	29 PCR+ mothers out of 100 suspected of COVID-19 (5/10)	27-40 at delivery (10 newborns; 19 pregnancies on-going).	No mother treated in ICU.	0/0. 3 newborns had respiratory distress due to prematurity; no other pathology.	10 newborns' PCR-: nasal and throat swabs, mothers' breast milk.
Salvatori (Italy)	2 (NA)	Term	No problems. Mild COVID-19 symptoms PP.	PP probably virus horizontal transmission from	No? PCR+: maternal and neonatal nasal swab at age 10d and

				third person to both mothers and newborns.	18d, respectively. PCR-: breast milk.
San-Juana R (Spain)	32 (1/6) cases of pneumonia out of 52 pregnancies with COVID-19.	22/32 in 3rd trimester	8/32 ARDS, 2/32 mechanical ventilation. All women were finally discharged.	0/0	No: "No cases of neonatal SARS-CoV-2 transmission were observed."
Santos RR (Portugal)	2 (2/2) PCR+ women out of 428 SARS-CoV-2-screened asymptomatic pregnant women. False positive outcome was not discussed.	NA	No symptoms or signs in the 2 mothers and newborns.	0/0	No. PCR+: neonatal swabs (throat and/or nasal).
Savasi (Italy)	77 (34/56)	12/57 were preterm.	1 in ECMO for 14 days; survived. Fever and dyspnea were associated with severe maternal respiratory deterioration.	0/0.	No(?). Neonatal nasal swab PCR+: 4/57 (3 in the first day of life). All had rooming-in and breastfeeding. None developed respiratory symptoms.
Schnettler (USA)	1 (0/1)	31 (32 at CS)	Critical disease with severe ARDS.	0/0. Mechanical ventilation of newborn for 3d but no complication.	PCR-: neonatal nasal swab and amniotic fluid.
Sentilhes (France)	54 (12/21) 21 live births, 1 IUFD. 16/54 were PCR- but met the Chinese management guideline criteria for suspected COVID-19.	2/21 were very preterm (<28 weeks).	13/54 needed oxygen support, 3/54 needed mechanical ventilation, 1/54 ECMO.	0/0. 1 mother still treated with ECMO. 3 newborns were intubated due to prematurity (27-28 weeks).	No. PCR-: neonatal throat and rectal swabs x2-3 in 21 newborns.
Sharma (India)	1 (0/1)	NA	No	0/0	No. "The newborn was transferred to

					the mother's side, breast fed, and tested negative for COVID-19 on day seven. The postnatal period was uneventful."
Silverstein (USA)	2 (0/2)	34, 36	Two young mothers without comorbidity but COVID-19 developed respiratory failure. Intubation, CS, mechanical ventilation.	0/0.	No. Neonatal PCR- (tissue unknown).
Sinelli M (Italy)	1 (1/1)	Term	An uneventful pregnancy.	0/0. On 2nd day after delivery, the mother became febrile. On day 5 of life, the newborn had perioral cyanosis, poor sucking, no tachypnoea, POX 88%. He was treated with 30% O2 for 2 days.	No? On 2nd day after delivery, both mother and child had nasal swab PCR+. Neonatal swab still PCR+ on day 21 of life. **Conclusion:** a newborn with COVID-19 may have hypoxemia without signs of respiratory distress.
Sisman J (USA)	1 (1/1)	Delivery after 34 weeks.	Morbid obesity (BMI 55). PCR+ at delivery.	0/0. Mild respiratory distress	Yes, probably. Nasal swab PCR+ at age 1, 2 and 14d. Placenta: electron microscopy showed viruslike particles, immunochemistry showed SARS-CoV-2 nucleocapsid protein.
Slayton-Milam S (USA)	1 (1/1)	33	While under mechanical ventilation due to COVID-19 with respiratory failure, forceps-assisted vaginal birth was induced.	0/0. Newborn was intubated for 24h but otherwise healthy.	No. PCR-: amniotic fluid, placenta, breastmilk (and nasal swab?). CXR-.
Song L (China)	1 (0/1)	36	No	0/0	No. PCR-: throat swabs at age 3 and 7 days.

Taghizadieh Ali (Iran)	1 (0/1)	34	Mother had acute tubular necrosis due to COVID-19.	0/0 The newborn was healthy.	Neonatal PCR- (probably nasal swab).
Takemoto MLS (Brazil)	20 death mothers IN Brazil reported up to 9 May 2020. 1 postmortem CS.	NA	Risk factors for maternal deaths: asthma (5/11)	20 COVID-19-related maternal deaths in Brazil (16 PP (80%))	NA
Tang Jy (China)	2 (1/2)	Term	No complication. Mothers had COVID-19 in 2nd trimester.	0/0	No. Neonatal throat PCR+: 0/2. No IgM antibody to SARS-CoV-2.
Tang MW (Netherlands)	1 (0/1)	41	At delivery, the mother developed immune thrombocytopenia (ITP), likely triggered by COVID-19.	0/0	No. The newborn did not develop any symptoms of COVID-19 or ITP.
Tanno S (Brazil)	1 (0/1)	32	Mother died at ICU after emergency CS	1/0	NA
Tegnell A (Sweden)	1 (NA)	NA	An overweight mother with COVID-19 and her fetus died both in a hospital ward.	1/1	NA
Topping A (UK)	1 (0/1)	NA	Mother was in ICU due to COVID-19 and died soon after emergency CS; the newborn survived.	1/0	NA
Tutiya CT (Brazil)	2 (0/2) emergency CS at ICU with mechanical ventilation.	32 and 29 weeks.	Both were obese. Postoperative deterioration but improved after anticoagulation therapy. Microthrombi in the lungs?	0/1 One newborn (32 weeks) died after severe neonatal asphyxia.	Nasal swabs for both newborns: PCR-. **Conclusion:** anticoagulation therapy may save lives in severe or critical COVID-19 cases.
Vallejo V (USA)	1 (0/1) Emergency CS due to maternal sickness.	37	BMI 30. Pneumonia, septic shock, acute kidney failure, thromboses, multiple organ failure.	1/0. Maternal death 36h PP.	No: "There was no evidence of neonatal or intra-amniotic infection."
Vintzileos WS (USA)	32	NA	32 (20%) PCR+ out of 161 mothers (all screened). 21/32	NA	No. All 29 newborns from PCR+ mothers were PCR- (probably nasal swabs).

			asymptomatic, 5 false +.		
Vivanti AJ (2020a; France)	100 (17/33). 36 newborns (3 sets of twins).	Week 14-PP. Preterm deliveries: 13/33.	99 had PCR+, 1 had CT scan+. 10 were admitted to ICU; 9/10 had mechanical ventilation. BMI for ICU patients: median 31 (range 26-42).	0/0. Neonatal intubations: 6 newborns.	No(?) Neonatal nasal swab PCR+: 1/36; asymptomatic.
Vivanti AJ (2020b; France)	1 (0/1) CS with intact membranes.	35		0/0. Newborn intubated during 6h. On the 3rd day of life, the boy showed irritability, poor feeding, axial hypertonia and opisthotonos. MRT showed brain gliosis.	Yes. Maternal viremia, placenta infection, neonatal viremia, neonatal neurological signs. Quantitative PCR+: maternal from high to low: placenta, blood, nasal swab, amniotic fluid, vaginal swab; neonatal from high to low: nasal and rectal swab, blood; non-quantitative PCR+: neonatal bronchoalveolar lavage fluid.
Wang J (China)	1 (NA)	NA	NA	0/0 "A neonate with SARS-CoV-2 infection, who had vomiting and milk refusal as the first symptom".	NA
Wang S (China)	1 (0/1)	40	No complication except mild COVID-19 symptoms.	0/0. No contact between mother and newborn.	No (?) PCR+ at 36h: neonatal pharyngeal swab. PCR-: placenta, cord blood, breastmilk.
Wang X (China)	1 (0/1)	30 (emergency CS 6 days later)	Severe maternal pneumonia; pathological CTG.	0/0. Mother and baby well after delivery.	No. Neonatal PCR- from amniotic fluid, placenta, umbilical cord blood, gastric juice, throat swabs.
Wang Z (China)	30 (7/30)	Median: 38	8/30 were asymptomatic. No severe comorbidity or complication.	0/0. All mothers recovered.	No. PCR- for all 30 newborns (tissue unknown).
Wen (China)	1 (0/0; ongoing pregnancy)	30	No complications so far. COVID-19 healed after treatment with interferon.	The baby was not born at time of publication	NA

WHO (China)	147 pregnant women (64 confirmed COVID-19, 82 suspected and 1 asymptomatic).	NA	8% had severe disease and 1% were critical.	NA	NA
Wu C (China)	8 (2/8)	33-40	6 mothers PCR+; the other two were not tested with PCR but had typical chest CT findings. PROM (2 cases), preeclampsia, fetal distress.	0/0	NA
Wu X (China)	23 (2/20; 2 vaginal, 3 legal abortions)	3 ≤12 weeks (abortions), 20 ≥28 weeks	No. The diagnosis of COVID-19 was based on PCR+ (19 cases) or clinical criteria (4 cases)	0/0. 21 healthy babies (including 1 pair of twins)	No. 4 PCR-, 17 clinically healthy.
Wu Y (China)	13 pregnancies, 5 births (1/5). 1 IUFD.	From 35+5 to 38+4 (2 preterm).	No. All had mild COVID-19, all were treated with O2, none was in ICU.	0/0. 2 cases of neonatal pneumonia.	No. Maternal PCR+: breastmilk 1/3 (PCR- at reexamination), stool 1/9, vagina 0/13. Neonatal PCR+ swabs: 0/5 throat, 0/4 anal.
Xiaoyuan F, cited by Ma (China)	6 (NA)	Term	NA	0/0 (all newborns recovered fully)	Uncertain. PCR+ for all 6; infections 30h–18d after birth.
Xiong X (China)	1 (1/1)	33+1. PCR+: maternal throat. SARS-CoV-2-specific IgG+ and IgM+: maternal serum.	PN at 38+4	0/0.	No. PCR-: maternal cervical secretion, rectal swab, breast milk and amniotic fluid; neonatal throat and rectal swab. SARS-CoV-2-specific IgG- and IgM-: maternal and neonatal sera. Pathology of the placenta: no inflammation or immunohistochemical sign of SARS-CoV-2
Xiong Y (China)	1 (0/1)	Probably term (newborn's weight 3 250 g)	The mother had low fever and contraction pains. PCR+ and CT showed ground glass	0/0. CXR 4d after birth had very small bronchovascular shadows and	Uncertain. Neonatal throat PCR+ immediately after birth.

			opacities bilaterally; therefore CS.	ground-glass opacity.	
Xu L (China)	5 (1/5)	34-38	Fever and mild pneumonia.	0/0.	No. Throat swabs PCR-: 5/5.
Xu Q (China)	28 (5/22) 23 newborns, 4 medical abortions, 2 continued pregnancies.	24/28 third trimester.	Pregnant and non-pregnant women with COVID-19 had similar clinical course.	0/0. 1 premature birth. No ICU patients.	No newborn was infected with SARS-CoV-2.
Yan J (China)	116 (14/99; 100 newborns incl. 1 pair of twins)	Mean 38 (IQR: 36-39)	Abnormal chest CT in 104/108 mothers; PCR+ in 65 mothers. 8 mothers in ICU due to severe pneumonia.	0/1. 1 early IUFD. No maternal death. 1 newborn died of neonatal asphyxia after being delivered by CS while the mother was in mechanical ventilation.	PCR-: amniotic fluid and cord blood (10 cases), neonatal throat swab (86 cases).
Yang H, Hu B, et al. (China)	27 (5/23) (23 mothers to 24 newborns; 4 still pregnant)	1 preterm (30 weeks)	Chest CT: typical viral pneumonia in 26/27 mothers.	0/0. 1 severe neonatal asphyxia.	No(?) Neonatal PCR-: 23 (1 not tested). The case of neonatal asphyxia was tested for SARS-CoV-2 immunoglobulins: IgM+, IgG+.
Yang H, Sun G, et al. (China)	13 (4/13)	NA	No complication	0/0; 2 premature newborns had respiratory distress syndrome	No. PCR-: an unknown number of newborns.
Yang P (China)	7 (0/7)	Symptom started 6d before – 2d after CS in week 36-38.	Severe preeclampsia prompted emergency CS in 2 cases.	0/0. 2 newborns were treated with nCPAP for mild grunting.	No. 5 newborns tested: PCR- for throat swab, amniotic fluid, cord blood.
Yao Li (China)	1 (0/1)	38		0/0	No. PCR-: Neonatal peripheral blood, nasal and anal swabs.
Yu N 2020-03-24 (China)	7 (0/7)	37-41; CS within 3 days of clinical presentation	Influenza, Legionella	0/0; no complications except SARS-CoV-2 (see right)	No? 3 infants tested; 1 had PCR+ and mild respiratory signs when 36h old; follow-up uneventful.
Yu N 2020-04-22 (China)	2 (0/0) current pregnancies	8+4, 8+5	Amniocenteses at 16-17 weeks for research	Current pregnancies	No. In amniotic fluid, PCR and SARS-CoV-2-specific IgM and IgG were all negative.

Yu Y (China)	1 (1/0)	34	PP ARDS treated with 14 (!) medicines. Mechanical ventilation for 11 days, with bedsores.	0/0.	Neonatal throat swab: PCR-.
Zamaniyan M (Iran)	1 (0/1)	32	The mother died 15 days after CS due to ARDS.	1/0. The newborn was healthy.	Yes, perhaps. Neonatal PCR-: initial throat swab, cord blood. PCR+: amniotic fluid, later throat swabs.
Zambrano (Honduras)	1 (1/1) Spontaneous vaginal delivery in week 32.	31	Prenatal US: dysplastic and multicystic right kidney.	0/0	No. PCR-: nasal and blood samples.
Zeng H (China)	6 (0/6)	3rd trimester	No	0/0, healthy	Uncertain. PCR-: throat swabs and blood in all newborns. SARS-CoV-2-specific IgM+: sera from 2 newborns. All sera had elevated IL-6.
Zeng L (China)	33 (7/33)	4 preterm babies	No	0/0; 2 term infants had lethargy, fever and pneumonia; one preterm (31w+2d) had asphyxia, fetal distress, pneumonia, RDS, and suspected sepsis. Follow-up was uneventful.	Yes or no? The 3 sick infants (see left) had PCR+ nasal and anal swabs at age 2d and 4d but not at age 6-7d. No data on virus in the other 30 infants.
Zeng Q-L (China)	3 (0/2; unclear if 2 or 3 infants were born).	30 and 37	Premature CS due to "possible foetal respiratory distress" (an unclear condition).	1/0. One mother had ARDS, was treated with ECMO and died 33d after delivery.	No. Neonatal throat swab x2: PCR-. The dead mother's newborn had pneumonia (chest CT); recovered.
Zeng Y (China)	16 (4/16)	34-41	PRC+ of respiratory specimens and ground-glass opacity on chest CT scan. No mechanical ventilation.	0/0	No. PCR- for all newborns; sort of specimen not mentioned.

Zhang L, Dong L et al. (China)	18 (1/18)	35-41; 3 preterm (age at delivery).	1 COVID-19 case was classified as severe, 0 as critical. Chest CT: 17/18 had pneumonia. Nasal swab PCR+: 8/18.	0/0	No. Throat swab PCR-: 18/18.
Zhang L, Jiang Y, et al. (China), cited by Schwartz	16 (0/16)	35-41 (age at delivery)	Comorbidity: gestational diabetes, preterm delivery, PROM, preeclampsia, fetal distress, et cetera	0/0. Bacterial pneumonia (3 newborns), 1 preterm.	No. Throat swabs in 10 babies: PCR-.
Zhang ZJ (China)	4 (0/4) out of 81 026 PCR+ patients in China up to 13 March 2020.	Term	Maternal COVID-19 before (2 cases) or after (2 cases) delivery.	0/0. Neonatal COVID-19 at age 30h, 5d, 5d, 17d. Mild disease. 1 asymptomatic.	Yes? CT scans in 3 newborns were pathological. Neonatal PCR+: nasal (2) or anal (2) swabs.
Zhou (China)	1 (0/1)	37+4	CS due to suspected fetal distress	0/0	No. PCR-: peripheral blood and throat swab.
Zhu (China)	9 (2/7; 10 newborns). 3 mothers became sick in COVID-19 1-3 days PP.	31-39; 6 babies were preterm	Fetal distress (6 cases).	0/1 One child died of MODS at 9 days of age.	No. PCR- throat swabs in 9 newborns.
Sum	**5721 pregnancies PN: CS: IUFD: 50 Legal abortions: 10. Unknown mode of delivery or current pregnancy at time of writing:**		**PCR+:**	**51 mothers dead, mostly in ARDS; 11 neonatal deaths.**	

Abbreviations: 10x, tests collected ten times; ARDS, acute respiratory distress syndrome; BMI, body mass index; CS, cesarean section; CSF, cerebrospinal fluid; CTG, cardiotocography; CXR, chest X-ray; d, day(s); DIC, disseminated intravascular coagulopathy; ECMO, extracorporeal membrane oxygenation; EM, electron microscopy; GA, gestational age; gw, gestational weeks; h, hour(s); ICU, intensive care unit; IgG, immunoglobulin G; IgM, immunoglobulin M; IL, interleukin; IQR, interquartile range; IUFD, intra-uterine fetal death; MODS, multiple organ dysfunction

syndrome; NA, data not available; nCPAP, nasal Continuous Positive Airway Pressure; PCR, polymerase chain reaction for detecting of SARS-CoV-2; PCR-/PCR+, negative/positive result of PCR test; PN, *partus normalis* (normal, vaginal delivery); POX, pulse oximeter reading (% O2 saturation); PP*, post partum* (after delivery); PROM, premature rupture of membranes; RDS, respiratory distress syndrome; RR, relative risk; T2DM, type 2 diabetes mellitus; US, diagnostic ultrasound; w, weeks.

*In most cases, the pregnant woman delivered within one week after the beginning of COVID-19 symptoms.

Studies which have contributed with references to additional studies

Alzamora (2020): *2 additional studies.*

Bastug (2020): *2 additional studies.*

Berkowitz KB (2020): *1 additional study.*

Carosso (2020): *1 additional study.*

Chambers C (2020): *1 additional study.*

Delahoy MJ (2020): *2 additional studies.*

Ellington (2020): *1 additional study.*

Kirtsman (2020): *1 additional study.*

Lokken (2020): *4 additional studies.*

Marín Gabriel MA (2020): *1 additional study.*

Panagiotakopoulos L (2020): *1 additional study.*

Pierce-Williams RAM (2020) *1 additional study.*

Santos RR (2020) *1 additional study.*

Sentilhes L (2020) *1 additional study.*

Takemoto MLS (2020) *2 additional studies.*

Systematic reviews which have been searched for missed primary studies

Included are systematic reviews that stopped review literature after May 1, 2020, and a randomized sample of earlier reviews.

Allotey J (2020)

Akhtara H (2020) *No relevant reference.*

Ashraf (2020)

Berbari (2020) *No relevant reference.* Also called Matar R et al. (2020).

Dana (2020) *No relevant reference.*

Dashraath (2020)

Della Gatta AN, Rizzo R, Pilu G, Simonazzi G, COVID19 during pregnancy: a systematic review of reported cases., American Journal of Obstetrics and Gynecology (2020). *No relevant reference.*

Deniz (2020) *4 relevant references.*

Di Mascio (2020) *No relevant reference.*

Elshafeey F (2020) *9 relevant references.*

Fernández-Carrasco FJ (2020) *1 relevant reference.*

Fretheim A. Barns rolle i spredning av SARS-CoV-2 (Covid-19) – en hurtigoversikt. Hurtigoversikt, 2020. Oslo: Folkehelseinstituttet, 2020. *1 relevant reference.*

Huntley

Irani (2020) *No relevant reference.*

Kasraeian (2020)

Khalil (2020)

Lackey (2020) *No relevant reference.*

Lopes de Sousa (2020) *5 relevant references.*

Martins-Filho (2020): *1 relevant reference.*

Mei (2020) *No relevant reference.*

Monteleone (2020) *No relevant reference; the table states that Wen et al. (2020) describe a delivery which is not true.*

Muhidin *1 relevant reference.*

Mullins

Panahi (2020)

Parazzini (2020) *No relevant reference.*

Rajewska (2020) *No relevant reference.*

RCOG 2020:8

Schwartz DA (2020): *1 relevant reference.*

Segars (2020): *no relevant reference.*

Simões E Silva (2020) *No relevant reference.*

Smith V (2020) *No relevant reference.*

Stumpfe FM et al. (2020): *No relevant reference.*

Tegnell A (2020) Underlag om gravida med covid-19. Folkhälsomyndigheten 2020-04-27. *3 relevant references.*

Thomas P et al. (2020): *1 relevant reference.*

Thornton

Trippella (2020) Trippella

Trocado V (2020) *No relevant reference. [no copy in my files but I read the paper]*

Walker

Zaigham and Andersson

Reviews and studies which may contain duplicates

The following reviews and studies were deleted from our review.

Blitz et al. (2020) includes patients who have been described earlier by Richardson et al., Vallejo et al., Blitz et al., London et al., McLaren et al. and Gulersen et al. These references except London (2020) are not included in Table 1 (see Blitz et al. 2020 for more information).

The 7 pregnancies described by **Breslin** (2020a) are probably a part of the cohort described by Breslin (2020b).

The 3 cases in **Suliman, Peng** (2020) et al. may have been included in the 17 cases in Suliman, June et al. which was published later than Suliman, Peng et al. Therefore, Suliman, Peng et al. was deleted. Var finns Suliman, June?

Chen L et al. is a review from Wuhan, China, which probably includes pregnancies reported in other studies from Wuhan.

Ferrazzi (2020a) was a preliminary version of Ferrazzi (2020b) and therefor deleted.

The case of **Karami** (death of a mother and child) was withdrawn on request of the authors. It may be one of the two mortal cases of **Karimi-Zarchi** since all three cases were from Zanjan, Iran.

Liu F, Liu H, Li J, et al. (2020): This paper is excluded from Table 1 because I suspect – but cannot prove – that this paper partly contains the same patients as **Liu H, Liu F, Li J et al. (2020).**

It is unclear how **Lu Q** (2020) relates to other studies. There are many uncertainties in the study.

Ramos Amorim (2020): see Table 2.

The case of **Wang S** et al. (2020) is included in Xiaoyuan F (2020).

Wu Y, Liu C, Dong L, et al. (2020) Viral shedding of Covid-19 in pregnant women. (March 25, 2020). Available at SSRN: https://ssrn.com/abstract=3562059 or http://dx.doi.org/10.2139/ssrn.3562059. This is a preliminary publication. Final publication: **Wu Y**, Liu C, Dong L, et al. (2020) Coronavirus disease 2019 among pregnant Chinese women: case series data on the safety of vaginal birth and breastfeeding. BJOG 2020;127:1109–1115.

Studies which were deleted, with reasons

Tam PCK (2020) was about transmission probably through breastmilk, but the infant was 8 months old (inclusive criterium was 0-28 days old).

Table 2.

Reference (country)	**Number of deliveries /CS**	**Gestational age at illness onset (weeks or weeks+ days)***		**Complications during pregnancy (in addition to maternal COVID-19)**	**Deaths in mother or child; complications after delivery**	
Breslin (2020a; USA)	7	26-37		BMI 23-47	Unknown	
Chen L	68/63 (118 pregnancies; 5 PN, 41 ongoing pregnancies, 70 live births including 2 pairs of twins)	14 of 68 were preterm (8 iatrogenic)		Abortions: spontaneous 3, induced 4; ectopic pregnancies 2	0/0; no case of neonatal asphyxia; non-invasive mechanical ventilation of 1 mother PP	
Karami (Iran)	1 (0/0)	30+0		During mechanical ventilation, there was a spontaneous vaginal birth with Apgar 0-0. The mother later died, probably of MODS and ARDS.	1/1	
Lu Q (China)	3 (NA)	NA		NA	0/0	

Ramos Amorim (Brazil)	9 maternal deaths (?/3)	3 cases: 32, 32, 35.	8 deaths PP, 1 death NA.	Maternal deaths: Iran 2, Brazil 5, Mexico 2. These deaths may have been described in other studies: Hantoushzadeh (Iran, 7 deaths), López-Gatell Ramírez (Mexico, 2 deaths), Karimi-Zarchi (Iran, 2 deaths), Tanno (Brazil, 1 death), Zamaniyan (Iran, 1 death)	NA
Wang S (China)	1(0/1)	40	The mother wore an N95 mask throughout the CS; the baby had no contact with the mother after birth.	0/0.	Yes or no? 36h after birth: PCR+ from neonatal throat swab; PCR- from cord blood, placenta, breast milk.

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