Review article

Pregnancy Outcomes with Coronavirus Infection (COVID-19)

Nasrin Fazel[1,2], Sina Shahrooyan[2], Shohreh Shahrouyan[3]

[1]*Iranian Research Center On Healthy Aging, Department of Medical-Surgical Nursing, School of Nursing and Midwifery, Sabzevar University of Medical Sciences, Sabzevar, Iran*
[2]*PhD in Public Health, Vienna University, Vienna, Austria*
[3]*Moscow State University of Medicine and Dentistry named after A. I. Evdokimo, Moscow, Russia*
[4]*Hakim University Sabzevar, Subzevar, Iran*

SUMMARY

Introduction: The clinical therapy of COVID-19 infection during pregnancy is still insufficient and limited. The current literature on COVID-19 infection during pregnancy and childbirth is summarized in this article, with a focus on maternal and neonatal outcomes.

Material and methods: From June 1 to September 7, 2020, a systematic search of pertinent medical subject heading (MeSH) terms, covered by the electronic databases Web of Science and Scopus, PubMed, Google Scholar, and SID key phrases including coronavirus or COVID-19 and pregnancy was undertaken. The search and selection criteria were restricted to English and Farsi literature. COVID-19 in pregnancy articles of all types were considered in the study. The references of relevant studies were also searched. After deleting duplicate and ineligible items, a total of 21 articles were collected.

Result: We found 21 studies with a total of 6,569 pregnant women who had COVID-19 infection: only one publication provided disease severity: 368 (95.6%) mild cases, 14 (3.6%) severe cases, and three (0.8%) serious cases. A total of 6,569 women gave birth more often by caesarean than by vaginal delivery. With multiple organ dysfunction syndromes (MODS), some women developed symptoms that necessitated ICU admission. The most commonly administered treatments for pregnant women with COVID-19 were hydroxychloroquine, Beclomethasone, Calamine, diclofenac sodium, Methylprednisolone, Azithromycin, Ganciclovir, Chinese herbal medicine, and Oseltamivir. The most commonly reported symptoms were fever and cough, followed by rhinorrhea, chest tightness, dyspnea, nasal congestion, and myalgias. Maternal outcomes included premature rupture of membranes, maternal death (21), gestational diabetes, preeclampsia, placental abruption, fetal distress, anemia, preterm birth (< 37 weeks), and fetal growth restriction, miscarriage, hypertension, and influenza. Neonatal intensive care unit (NICU) admission, prematurity, birth weight 2,500 g, preterm delivery (37 weeks), fetal discomfort, neonatal asphyxia, stillbirth (5), and neonatal death (9) were among the outcomes for babies. All of the infants had good Apgar scores.

Conclusion: Prenatal and neonatal outcomes appear to be favorable in the majority of cases. Pregnant women and babies should be considered particularly vulnerable populations in terms of COVID-19 preventive and management strategies.

Key words: **COVID-19, novel coronavirus, pregnancy, fetus, newborn**

Corresponding author:
Nasrin Fazel
e-mail: shohreh1368@yahoo.co.uk

INTRODUCTION

The World Health Organization declared a new coronavirus pandemic on March 12, 2020, based on more than 20,000 verified cases and almost 1,000 deaths in Europe (1). The most deadly outbreak in COVID-19 history began as an epidemic in China and swiftly spread to many other countries, with the percentage of affected people increasing on a regular basis. The amount of excess fatalities per 100,000, according to the World Health Organization, provides a more impartial picture of the pandemic than COVID-19 mortality data (2). Pregnancy-related physiological maternal adaptations are hypothesized to predispose gravid women to a more severe course of pneumonia, resulting in increased maternal and fetal morbidity and mortality. However, there is a scarcity of information concerning the effects of COVID-19 infections during pregnancy in the literature, which limits both counselling and management of these patients (3). The presence of COVID-19 in a pregnant patient is concerning because different Corona virus families have been linked to a variety of negative outcomes (1). Past experience with SARS and MERS in gravidity suggests that these coronaviruses are potential of affecting negative medical results, including serious parental sickness that necessitated hospitalization, sometimes in the critical care unit with or without ventilatory support. Despite the fact that both of these coronaviruses can cause maternal morbidity and mortality in a small but noticeable number of cases, the precise risk factors for pregnancy fatality have yet to be determined (4). According to data from SARS-CoV and MERS-CoV, pregnant women may be at a higher risk of severe illness, morbidity, or death than the general population. COVID-19 is currently unknown, with the majority of information relating to its effects on pregnant women and their fetuses (5). Furthermore, the SARS-CoV-2 virus was shown to be 85% similar to SARS (SARS-CoV) and MERS

(MERS) (MERSCoV). Preterm births, stillbirths, respiratory problems, and maternal death were all reported among pregnant women during the SARS and MERS epidemics (6). Around 25% of pregnant women who contract pneumonia would need to be hospitalized to a critical care unit and will necessitate ventilator assistance. Premature rupture of membranes (PROM) and preterm labour (PTL), intrauterine fetal death (IUFD), intrauterine growth restriction (IUGR), and neonatal death are the most prevalent obstetrical outcomes related with maternal pneumonias of any kind (4).

Premature rupture of membranes (PROM) and preterm labor (PTL), intrauterine fetal death (IUFD), intrauterine growth restriction (IUGR), and newborn death are the most prevalent obstetrical outcomes associated with any type of maternal pneumonia (4). Among the 38 pregnant women diagnozed with COVID-19 at the epicenter of the pandemic in China, reported complications included preeclampsia, low birth-weight (< 2500 grams) neonates, caesarean sections, fetal distress, chorioamnionitis, meconium staining, premature rupture of membranes, and premature newborn. These coronaviruses, however, have occasionally caused severe maternal pneumonia, maternal fatalities, and early pregnancy losses (7). Moreover, in a Hong Kong cohort, clinical outcomes in women with SARS were worse among pregnant than non-pregnant women. MERS-CoV infection can cause severe illness and/or catastrophic maternal and/or fetal outcomes in pregnant women. The pathogenesis of this virus is, however, poorly understood. Despite the absence of data on the effects of these medications in pregnant humans, ribavirin is normally restricted during pregnancy (4). The creation of a coronavirus never before seen in humans, initially reported on December 1 in Wuhan, China, has been shown to have a substantial effect on gravid women and their fetuses (8). However, there are currently just a few reports on pregnant women infected with COVID-19 (9). Despite rising public awareness of COVID-19, little is known about the illness's impact on pregnancy (COVID-19), particularly in terms of its implications on pregnant women and newborns, and there is no COVID-19 evaluation or treatment guidelines accessible for pregnant women. Therefore, this review article was undertaken with the aim of estimating pregnancy outcomes with coronavirus infections (COVID-19).

METHODS

The goal of this study was to gather and examine literature on COVID-19's maternal, fetal, and neonatal outcomes during pregnancy.We used MeSH-compliant keywords and word variations such as COVID-19, pregnancy, baby, coronavirus 2019, SARS-CoV-2, and 2019-nCoV to search and review all publications published in a number of databases, including PubMed, Scopus, SID, Science Direct, and Web of Science, from June 1 to September 7, 2020. All original research studies, letters to the editor, and reviews on COVID-19's influence on maternal, perinatal, fetal, and neonatal outcomes were included. Two researchers independently analyzed the title and abstract of all publications using specific keywords, gathered the relevant articles, and then summarized and presented their findings. This review does not require ethical approval. We examined the pregnancy outcomes linked with COVID-19 coronavirus infections utilizing data from previous articles or internet page up to June 1, 2020. For coronavirus or COVID-19 and pregnancy, we employed a combination of relevant medical subject heading (MeSH) phrases, key words, and word variations. The search and selection criteria were limited to books in English and Farsi.

RESULTS AND DISCUSSION

Characteristics of the studies that were included

Using precise keywords to search the databases generated 880 articles. Following the removal of duplicates and an assessment of abstracts and

Table 1. *General characteristics of the included studies*

Author	Year	Study location	Study period	Study design	Type of coronavirus	Pregnancies No.	Mean maternal age
Mojgan Karimi-Zarchia	2020	Iran	2020	A review article	COVID-19	31	-
Noelle Breslin	2020	New York	2020	Case report	COVID-19	2	33 - 38
Dongmei Caoa	2020	China	2020	Retrospective study	COVID-19	10	29 - 35
Noelle Breslin	2020	New York	2020	Retrospective study	COVID-19	43	29.7
Daniele Di Mascio	2020	Italy	2020	Systematic review and meta-analysis	SARS, MERS, COVID-19	79	34.6
Anna Nunzia Della Gatta	2020	Italy.	2020	Systematic review of reported cases	SARS-CoV-2 COVID-19	51	30
Shaoshuai Wang	2020	China	2020	Case report	COVID-19	1	34
Sascha Ellington	2020	United States	2020	Retrospective study	COVID-19 SARS-CoV-2	8,207	15 – 44
Huijun Chen	2020	China	2020	Retrospective study	COVID-19 SARS-CoV-2	9	26 – 40
Nan Yu	2020	China	2020	Retrospective study	COVID-19 SARS-CoV-2	7	32
Ziyi Yang	2020	China	2020	Systematic review	COVID-19	114	none
Suliman Khan	2020	China	2020	Case report study	COVID-19	3	29.3
Oscar Martinez-Perez	2020	Spain	2020	Research letter	COVID-19	82	35
Yangli Liu	2020	China	2020	Retrospective study	SARS-CoV-2	13	22 - 36
David A. Schwartz	2020	Georgia	2020	Retrospective study	COVID-19 SARS-CoV-2	38	26 and 40
Leila Asadi	2020	Iran	2020	Review study	COVID-19	9	27
Cuifang Fan	2020	China	2020	Case report	COVID-19 SARS-CoV-2	2	29 and 34
Christine M Salvatore	2020	New York, NY, USA	2020	Observational cohort study	SARS-CoV-2	116	-
Latif Panahi	2020	Iran	2020	Narrative review	Coronavirus 2019, SARS-CoV-2 , 2019-nCoV	37	23 - 40
Farida Elshafeey	2020	Egypt	2020	Systematic scoping review	COVID-19	385	-
Carina Rodrigues	2020	Brasil	2020	Systematic review	COVID-19	212	22 - 43

titles, 21 articles were found to be relevant. So far, no original research on COVID-19 has been published, with only four case studies or case series, seven retrospective studies, and seven review studies. Other forms of publication included correspondence, criticism, and letters to the editor. Table 1 lists the structures of the studies that were included.

Signs and symptoms

COVID-19 infections are mild or asymptomatic in about 80% of cases; severe in 15% of cases, needing supplemental oxygen, and critical in 5% of cases, needing mechanical breathing (22). Fever and cough were the greatest commonly reported indications followed by rhinorrhea, chest tightness, dyspnea, nasal congestion, myalgias, or headache, chest pain, dyspnea, anosmia, diarrhea, (11) fatigue, cholecystitis and/or dysgeusia, lymphopenia, myalgias, chills, and abdominal pain, nausea or vomiting. Fever (87.5%) and cough (53.8%) were the most prevalent symptoms stated in one study, tracked by fatigue (22.5%), diarrhoea (8.8%), dyspnea (11.3%), sore throat (7.5%), and myalgia (16.3%) (12). Symptoms were reported by 65.2% of pregnant women and 90.0% of non-gravid women in a recent study. Cough (51.8% against 53.7%) and shortness of breath (30.1% against 30.3%) were also reported at similar rates by symptomatic pregnant and non-gravid women (13). Some of COVID-19's clinical manifestations coincide with symptoms of normal pregnancy (for example, exhaustion, shortness of breath, nasal congestion, nausea/vomiting), which must be taken into account while evaluating afebrile women (14). Because they are immunocompromized, gravid women are especially vulnerable to respiratory pathogens and severe pneumonia, and physiological adaptations during pregnancy (e.g., diaphragmatic displacement, higher oxygen intake, and mucosal swelling of the airways) can make them hypoxia intolerant (15). Gestational rhinitis, caused by estrogen-mediated nasopharyngeal hyperemia, affects around one-fifth of healthy pregnant women (10). Significant acute hypoxemic respiratory insufficiency related to acute respiratory distress syndrome is the most common finding in very ill COVID-19 patients (ARDS) (14). Fever, cough, dyspnea, and lymphopenia are the most prevalent signs and symptoms of COVID-19 in pregnant patients, just as they are in non-gravid patients. Immune responses in gravid and non-gravid COVID-19 women should be studied further in relation to disease severity. These

reactions could be the main immunological reply to SARS-CoV-2, resulting in COVID-19 being milder (10). The most typical obstetrical consequences related with maternal pneumonias of any kind consist of premature rupture of membranes (PROM) and preterm labor (PTL), intrauterine fetal death (IUFD), intrauterine growth restriction (IUGR), and baby decease (4). Wang et al. reported that 26% of mothers in their cohort were fully asymptomatic. Because approximately half of the moms were only symptomatic soon before or during birth, it is unlikely that protective maternal antibodies were produced in all newborns. Furthermore, their findings demonstrate no difference in newborn outcome based on whether or not the moms were symptomatic. It is unclear if this was due to innate physiological variations or early infection control tactics (16). Fever, cough, and chest pain were the most prevalent symptoms among infected mothers. All of the moms' lungs were normal upon arrival, but chest CT scans revealed unilateral and bilateral infiltrations. Two of the 37 mothers evaluated experienced COVID-19 clinical manifestations during birth, two experienced symptoms after delivery, and the remainder had COVID-19 symptoms during hospitalization and prenatal delivery (17). Dehan Liu acquired CT pictures before and after delivery, which revealed no evidence of COVID-19 pneumonia worsening. The severity of COVID-19 pneumonia was not exacerbated by pregnancy or delivery. Furthermore, their findings suggest that pregnant patients with COVID-19 pneumonia should be assessed for significant fetal issues, taking into account both medication toxicity and viral infection (18). According to Huijun Chen et al., seven of the nine patients had fever without chills, although none had high fever (body temperature > 39°C). The body temperatures of the patients ranged from 36.5°C to 38.8°C. Both patients exhibited postpartum fever (range 37.8 – 39.3°C) despite having a normal body temperature before caesarean section. Four of the patients had cough, three had myalgia, two had a sore throat, and two had malaise, all of which indicated an upper respiratory tract infection. Furthermore, one of the patients appeared to be suffering from stomach problems. Another patient had preeclampsia and shortness of breath as a result of her pregnancy. As of February 4, 2020, none of the nine patients have developed severe pneumonia requiring mechanical support or died from COVID-19 pneumonia (15). Expectant mothers admitted to a

level III or IV in hospitals, with severe disease, an oxygen requirement with comorbidities, or critical disease should be cared for by a multispecialty team at a hospital that provides both obstetric and adult intensive care services (ICU) (14).

Drugs

The drugs for COVID-19 pregnant women were hydroxychloroquine, cefaclor, eclomethasone, topical calamine lotion, diclofenac sodium, ceftazidime, methylprednisolone, azithromycin, ceftriaxone, intravenous hydration, ganciclovir, oral Lianhua Qingwen capsules (Chinese medicine), Abipenem, ornidazole, methylprednisolone, cephalosporins, quinolones, and macrolides, cefotiam hydrochloride, moxifloxacin, oxygen therapy, oseltamivir, interferon, atomisation inhalation, and Arbidol tablets. Shaoshuai Wang et al. described a pregnant woman who got antiviral treatment, which included 40 g of recombinant human interferon 1b atomized inhalation with 2 mL of sterilized injection water twice a day and ganciclovir (0.25 g. every 12 h, intravenously). Anti-infection drugs included Abipenem (0.3 g intravenously every 12 h) and moxifloxacin (0.4 g intravenously per day) (19). The WHO advises against using systemic corticosteroids on a regular basis since they appear to postpone viral clearance while providing little benefit in terms of survival. They are only useful when an early preterm birth is required for medical or obstetrical reasons. The use of corticosteroids to speed fetal maturation and reduce peripartum problems may then be evaluated on an individual basis (10). In addition, when opposed to normal therapy or placebo, systemic corticosteroids were associated with a lower period of 28 days all-cause mortality in seriously ill COVID-19 patients (20). However, the benefits to the neonate are less obvious for gravid patients with doubted or established COVID-19 at 34+0 to 36+6 weeks of gestation and at risk of preterm birth in 7 days, and ACOG has recommended against managing a course of betamethasone to such patients. However, these decisions may need to be taken on a case-by-case basis, taking into account the neonatal benefits as well as the risks of harm to the pregnant patient (14). Remdesivir and chloroquine have been found as strong candidates for the management of COVID-19 in recent research (21). In human pregnancies, the new remdesivir looks to be safe, and phase 3 trials investigating its efficacy in COVID-19 are presently being conducted (22). Remdesivir is being adminis-

tered to gravid women with severe COVID-19 at some hospitals under a compassionate-use protocol. NSAIDs should not be avoided in COVID-19 patients when clinically necessary, according to ACOG, WHO, and the European Medicines Agency (14). Chloroquine phosphate is a widely used antimalarial quinolone that has antiviral and immunomodulatory properties. It appears to be useful in reducing the time it takes for COVID-19 to resolve clinically, radiologically, and serologically. Despite the fact that chloroquine and its metabolites pass through the placenta, it is safe to consume throughout all three trimesters of pregnancy with no increased risk of perinatal problems (10). The results of randomised trials show that giving hydroxychloroquine or chloroquine has no benefit. Heart rhythm abnormalities (QT interval prolongation and ventricular tachycardia) are also common adverse maternal effects, especially in individuals taking other medicines that lengthen the QTc interval (14). Traditional Chinese remedies were also administered, such as Jinyebaidu granules and Lianhuaqingwen pills. A gravid woman with Covid-19 was treated with azithromycin (500 mg po qd), oseltamivir (75 mg po bid), and Lianhua qingwen capsules, according to Cuifang Fan (1.2 gm po bid). The CT chest scan was redone due to the continued fever, which revealed patchy consolidation in both lungs. For probable pneumonia, she was given two doses of methylprednisolone (20 mg IV daily). The fever lingered, but the rash on the skin had greatly improved (23).

Perinatal and maternal outcomes

We identified 21 researches reporting on 6,569 gravid women with COVID- 19 infection. One article has reported 368 (95.6%) mild, 14 (3.6%) severe, and 3 (0.8%) critical cases of pregnant women with COVID-19 (24). Two patients were asymptomatic at the time of admittance but developed usual symptoms after a couple of days, according to a systematic review. At the time of admission, the majority of patients exhibited minor symptoms or were classified as mild or typical COVID-19 (12). The link between COVID-19 and an increased risk of miscarriage or congenital abnormalities is currently being researched. Preterm delivery, intrauterine growth restriction, spontaneous abortion, infants small-for-gestational-age, young babies relative to gestational age, NICU admissions, kidney failure, and intravascular coagulation were all observed perinatal complications in women who had other coronavirus

Table 2. *Clinical characteristics and maternal outcomes*

Study	Number of pregnant women	Initial signs and symptoms (number)	Other symptoms (number)	Complications and comorbidities (number)	Treatment	Gestational weeks	Delivery mode (number)	C-section indication	Severe type or special cases
Mojgan Karimi-Zarchi	31	No effect on clinical symptoms or time of presentation after symptom onset (10)	Longer hospital stay, renal failure, sepsis, and disseminated intravascular coagulation (DIC+), mechanical ventilation)	Deceased mothers (2)	Treatment of uterine contraction, fatigue, carbetocin or arboprost tromethamine (16)	32 – 34 weeks (16)	CS and ND	Not declared	ICU hospitalization and mechanical ventilation (4)
Noelle Breslin	2	Case 1 and 2, both: fever, cough, shortness of breath, or sore throat	None	Admitted to the hospital (4), required supportive care with intravenous hydration (2), chronic hypertension (1)	Case 1 and 2, both: hydroxychloroquine, azithromycin, ceftriaxone	Case 1and 2, both: 37	Case 1 and 2, both: cesarean delivery	Case 1: due to arrest of descent Case 2: due to a failed induction	Case 1 and 2, both: ICU admission
Dongmei Caoa	10	Cough (1), fever which lasted from prenatal to postpartum period (2), postpartum fever (5); only one patient had high fever (body temperature > 39.1^{0}C (1)	Lymphopenia (1), lung abnormalities on chest CT images after delivery (10), single lobe (4), cases with bilateral multilobe lesions (6), peripheral distribution (2), random distribution (5), diffuse distribution of pulmonary lesions (2), abnormalities on pulmonary CT images(10)	PROM (4), gestational diabetes (1), preeclampsia (3), placental abruption (1), fetal distress (2), hypothyroidism (1), anemia (1)	Not reported	33 - 40	Vaginal delivery (2), cesarean section (8)	Fetal distress, (4), elective cesarean (4)	None
Noelle Breslin	43	Fever (14), dry cough (19), dyspnea (7), myalgia or fatigue (11), headache (8), chest pain (5), anosmia, and/or dysgeusia (14), diarrhea (0)	Women who exhibited mild disease (37), severe disease (4), critical disease (2)	Intermittent asthma (representing the most common comorbidity), type 2 diabetes mellitus, chronic hypertension, asthma, thyroid disorder, seizure disorder, and dermatological disease	Hydroxychloroquine, ceftriaxone, azithromycin, intravenous hydration	37	Cesarean section (33), normal vaginal delivery (10)	Cesarean deliveries were performed for non-reassuring fetal heart tones (n¼43), repeat cesarean (n¼42), arrest of descent (n¼41), arrest of dilation (n¼41), and failed labor induction (n¼41)	ICU admission (2)
Daniele Di Mascio	41	Chest pain, pneumonia, fever (82.6%), cough (57.1%), and dyspnea (27.0%)	Lymphopenia (40), elevated liver enzymes (9)	Preterm birth <37 weeks (14/32) and 34 weeks (4/32) (PROM), preeclampsia, fetal growth restriction, maternal death (2), fetal distress(12)	Lopinavir/ritonavir or seltamivir ribavirin, steroids	34 - 37 weeks	84% were delivered by cesarean section	Not reported	Need for mechanical ventilation (16) admission to ICU (22)
Anna Nunzia Della Gatta	51	Dry cough, postpartum fever (8), Myalgias (3), malaise (2), dyspnea (4), sore throat (5), diarrhea (2), fatigue (3), cholecystitis (2)	Positive chest x-ray result for pneumonia (1), increased concentrations of alanine aminotransferase and aspartate aminotransferase (2), chest computed tomography confirmatory test for typical signs of viral infection (22)	Gestational hypertension (1) preeclampsia (1), influenza (1) infection in the second rimester (2), infection in the third trimester(49), intrauterine fetal demise (1)	Not reported	36.5 weeks (interquartile range) 35 - 38	Cesarean delivery (46), birth vaginally (2)	Pneumonia (19), PROM (9), fetal distress (6), preterm labor (4), previous cesarean delivery (3), previous stillbirth (2), pregnancy at term (2), elevated liver enzymes (1),	ICU admission and MODS associated with acute respiratory distress (ARDS) requiring intubation and mechanical ventilation (1)

									preeclampsia (1), placenta previa (1), placental abruption (1), multiple organ dysfunction syndrome (1), oligohydramnios (1), sychosocial factors	
Shaoshuai Wang	1	Fever	Hospitalized for suspected viral pneumonia, lymphopenia, neutrophilia, elevated hs-CRP level	Hypothyroidism	ganciclovir abipenem moxifloxacin, methylprednisolone	40-week	Cesarean section	Not reported	None
Sascha Ellington	5355 (9.0%)	Cough (1,799) ,fever (1,190) muscle aches (1,323), chills (989) headache (1,409), shortness of breath (1,045), sore throat (942), diarrhea (497), nausea or vomiting (682), abdominal pain (350),runny nose (326), new loss of taste or smell (587)	Hospitalized	Diabetes mellitus (288), chronic lung disease (409), cardiovascular disease (262), chronic renal disease (12), chronic liver disease (8), immunocompromized condition (66), neurologic disorder, neurodevelopmental disorder, or intellectual disability (17), other chronic disease (162), death (16)	Not reported	Not reported	Not reported	Not reported	Admitted to the intensive care unit (ICU) (120), received mechanical ventilation (42)
Huijun Chen	9	Fever (7), cough (4), myalgia (3), sore throat (2), and malaise, gastrointestinal symptoms	Lymphopenia (5), increased aminotransferase (3), elevated ALT or AST	Gestational diabetes (1), hypertension (27), pre-eclampsia at 31 gestational weeks, influenza (1), virus preeclampsia, PROM. preterm labour (4)	All patients were given oxygen support (nasal cannula) and empirical antibiotic treatment	36 - 39	Caesarean section	Severe pre-eclampsia, a history of caesarean sections and fetal distress.	None
Nan Yu	7	Fever (6), cough (1) shortness of breath (1) and diarrhoea	High concentrations of C-reactive protein (7), H1N1 (1) legionella pneumophila co-infections (1), bilateral pneumonia (6), unilateralpunemonia (1)	Chronic diseases (hypothyroidism and polycystic ovary syndrome) (2), uterine scarring (3)	Received oxygen therapy via nasal catheter in isolation (7), received antiviral treatment, including oseltamivir, ganciclovir, and interferon, atomisation inhalation, arbidol tablets (7), traditional Chinese medicines, such as jinyebaidu granules and lianhuaqingwen capsules, cephalosporins, quinolones, macrolides, methylprednisolone (5)	37 - 41	Caesarean section	Not reported	None
Ziyi Yanga	114	Fever (87.5%) and cough (53.8%) were the most commonly reported symptoms, fatigue (22.5%), diarrhea (8.8%), dyspnea (11.3%), sore throat (7.5%), myalgia (16.3%)	Postpartum fever (6), myalgia (3), malaise (2), cough (4), dyspnea (1), sore throat (2), diarrhea, nausea and vomiting (1), chest	Induced abortion (2), influenza (1), gestational hypertension (1), preeclampsia (1), fetal distress (2), oligohydramnios (1), PROM and preterm labor	Not reported	Not reported	Majority of patients had cesarean delivery	Preeclampsia, fetal distress, history of previous C-sections, unknown risk of intrapartum mother-	Severe or critical type (6), multiple organ failure and use of extracorporeal membrane oxygenation (1)

			distress and anhelation (1)	(1), severe preeclampsia (1), GDM (3), uterine scar (2), PROM (3)					to-child transmission by vaginal delivery	
Suliman Khan	3	Case 1 and 2, both: fever and cough. Case 2: cough and chest tightness	None	Case 1: 1 live preterm baby	Case 1: azithromycin, oral lianhua qingwen capsules (Chinese medicine), and oseltamivir antiviral drugs Case 2 and 3, both: antibiotics, antiviral drugs, and intermittent oxygen inhalation	case 1:34 weeks Case 2:39 weeks case 3:38 weeks	Case 1, 2, and 3: vaginal delivery	None	None
Oscar Martینez-Perez	82	None	Mild COVID-19 symptoms (11), lymphopenia (7)	Severe COVID-19 symptoms (4), including with concomitant preeclampsia (1), PROM (4) gestational diabetes (1), preeclampsia (4), asthma (6) hypothyroidism (3), epilepsy (1), muscular dystrophy (1), myopathy (1), heterozygous factor mutation (1), psychiatricdisorders (3),unspecified autoimmune disease (1), hyperprolactinemia (1), gastritis (1), vitiligo (1), and chronic hepatitis infection (1), hypothyroidism (2), homocysteine mutation (1), anti-Kell alloimmunization (1), concomitant pyelonephritis (1), myomatosis (1), mutation of methylenetetrahydrofolatereductase (MTHFR) (1), ischemic cardiomyopathy (1), depressive disorders (1)	Not reported	29 - 39	Delivered vaginally (41), cesarean deliver y (37)	Not reported	ICU admission (5)
Yangli Liu	10	Fever fatigue (10), dyspnea (3), sore throat and shortness of breath (less)	Not report	Underlying medical disease (0), preterm labor (6)	Not reported	32 – 36 (6)	Caesarean section (10)	Fetal distress (3), premature rupture of the membrane (1) and stillbirth (1), preterm labor between 32 - 36 weeks of gestation (6)	ICU admission with MODS including ARDS requiring intubation and mechanical ventilation, acute hepatic failure, acute renal failure and septic shock (1)
David A. Schwartz	38	Febrile women upon admission (7), cough (4), myalgia (3), sore throat (2), malaise (2), gastrointestinal symptoms (1), shortness of breath (1)	Elevated c-reactive protein (6), lymphopenia (5), increased (ALT) and (AST)(3), chest CT scans were abnormal (8)	Influenza (1), gestational hypertension occurring since 27 weeks of gestation (1), and preeclampsia developing at 31 weeks of gestation (1) fetal distress (8), (PROM) (10) CT scan of the chest revealed bilateral ground glass opacities	Not reported	30 and 40	Cesarean sections (36), vaginal deliveries (2)	Decreased fetal movement and abnormal fetal heart monitoring	None

				and pulmonary consolidation (1), gestational hypertension (1), oligohydramnios and polyhydramnios (1), umbilical cord abnormalities (2), placenta previa (1), vaginal deliveries (6), preeclampsia, pregnancy-induced hypertension, uterine scarring (2), preterm (3), gestational diabetes (3), and uterine atony (1)					
Leila Asadi	23	Fever cough, myalgia (3), sore throat and weakness (2), lymphopeniapneumonia (3)	Not reported	Deceased mothers (1) due to respiratory distress	Not reported	32 - 36	Cesarean sections (22), delivery (1)	Fetal distress (3), premature rupture of the fetal membrane (1), preterm labor between 32 - 36 weeks of gestation (13)	Admitted to the intensive care unit (ICU) with MODS (6)
Cuifang Fan	2	Case 1: Fever, rash on her abdomen Case 2: She developed chill, fever (37.6 - 38.5° C), nasal congestion, and sore throat in January	Case 1: rash on the abdomen, nasopharyngeal swab was positive. High level of IgG antibody (178Au/ml) to SARS-CoV-2. Case 2: CBC lymphopenia (14.4%). Nasopharyngeal swab turned out to be positive for SARS-CoV-2	Case 1:cefotiam hydrochloride, ornidazole, methylprednisolone within 72 h of delivery Case 2: the same day she was discharged from hospital for vaginal bleeding	Case 1: cefaclor, beclomethasone, calamine topical, Azithromycin, oseltamivir, Lianhua qingwen, methylprednisolone Case 2: diclofenac sodium, ceftazidime, oseltamivir, lianhua oingwen,, methylprednisolone	Case1:37 Case 2:36	Case 1 and 2, both: C section,	Not reported	None
Christine M Salvatore	116	Cough (29), anosmia or ageusia (27), fever (24), rhinorrhea (11), myalgia (11), shortness of breath or respiratory distress (8), headaches (7), mothers reported that they had never been symptomatic (78), symptomatic (58)	Symptoms onset more than 2 weeks before delivery and were asymptomatic at delivery (27/58), 31 had symptoms onset within 2 weeks before delivery (31/58)	Rupture of membrane < 18 h (67), 20 ≥ 18 h (9)	Not reported	36 - 38	Caesarean section	Arrest of labor (12), non-reassuring fetal tracing (6)	None
Latif Panahi	37	Fever, cough, and chest pain	Lymphocytopenia, clinical manifestations of COVID-19 during delivery (2), and also after delivery (2) during hospitalization and prenatal delivery (rest)	Fetal distress, miscarriage, respiratory distress and, preterm labor at 30 - 33 weeks of age (7) PROM (6), abnormal amniotic fluid (2), abnormal umbilical cord (2)	Antiviral, antibiotic, and oxygen therapy	34 - 40 weeks	Cesarean delivery (29), normal delivery (8)	Not reported	ICU admission and oxygen through the venturi mask (1)
Farida Elshafeey	375	Fever (259), cough (253), dyspnea (28), diarrhea (28), sore throat (27), fatigue (27), myalgia (24), chills (21)	Nasal congestion, rash, sputum production, headache, malaise, loss of appetite. Mild (368), severe (14) and critical (3), critical cases had MODS, ARDS, beyond 24 weeks of gestation (276), early pregnancy (109),	Induced abortion (4), spontaneous abortion (3) tubal pregnancy(2)	Not reported	30 - 41 weeks	175 /252 cesarean and vaginal births (77)		Admitted to ICU (17), mechanically ventilated (6), maternal mortality (1), ECMO (1)

			elevated d-dimer (86), elevated C-reactive protein (72), lymphopenia (54), increase in liver enzymes (AST (22), ALT (21), thrombocytopenia (4)						
Carina Rodrigues	212	Not reported	Not reported	Fetal distress (20), gestational diabetes (13), gestational hypertension (11), (PROM) (7), anemia (5), placenta previa/bleeding in the third trimester (5), pre-eclampsia (4), hypothyroidism (4), chronic hypertension (3), thalassemia(2), polycystic ovary syndrome (2), cholecystitis (2), asthma (2), diabetes mellitus type 2 (2), placental abruption (1), oligohydramnios (1), polyhydramnios (1), hepatitis B infection (1), mitral valve and tricuspid valve replacement (1)	Not reported	30 – 41 weeks	Cesarean (139/158)	Admitted for labor induction, did not specify the indication, emergency cesarean for a stillbirth, high BMI, history of medical complications	Admission to ICU (4)

PROM = premature rupture of membrane. NA = not applicable. ALT = alanine transaminase. AST = aspartate transaminase, MODS = Multiple organ dysfunction syndrome (MODS), ARDS = acute respiratory distress yndrome ICU = intensive care AHF: acute heart failure; ALT: alanine transaminase; AST: aspartate transaminase, PROM = premature rupture of membranes MTHFR = methylenetetrahydrofolatereductase COVID-19 = coronavirus disease 2019 H1N1 = Hemagglutinin 1 Neurominidase 1 = Influenza Swine Flu = A strain of influenza, the most common cause of flu in humans; also the strain responsible for swine flu

Table 3. *Fetal and neonatal outcomes*

Study	Number of fetuses with available data	Adverse fetal and neonatal outcomes (number of neonates)	Number of neonates tested with SARS-CoV-2	Samples (time of sample collection)	Sample test results (number)
Mojgan Karimi-Zarchia	Not reported	No significant differences in fetal distress, meconium-stained amniotic fluid, preterm delivery, and neonatal asphyxia (16)	None	Placenta or neonatal throat swabs by RT-PCR.	Negative
Noelle Breslin	2	None	None	First day of life	Case1: negative Case 2: negative
Dongmei Cao	11	Premature (4), birth weight lower than 2,500 g (2) 1-min Apgar score of 8 – 9 and a 5-min Apgar score of 10 (11)	5	Throat swab test	Negative
Noelle Breslin	18	Apgar scores of 7 at 1 minute and 9 at 5 minutes (18),NICU (3), prematurity at 34 weeks (1), evaluation of a congenitally diagnosed multicystic dysplastic kidney after delivery at 39 weeks (1), respiratory distress with concern for sepsis at 37 weeks (1)	18	First day of life (15)	Negative
Daniele Di Mascio	41	Perinatal death (2), admitted to the neonatal intensive care unit (1), preterm birth < 37 weeks, 34 weeks (14), Apgar score < 7 (1)	Not reported	Not reported	Vertical transmission (0)
Anna Nunzia Della Gatta	48	Stillbirth (1), neonatal death (1), admitted to the NICU because of shortness of breath and moaning (1)	48	Neonatal throat swab samples were collected within 72 h after birth	Pharyngeal swabs tested positive by rRT-PCR assay 36 hours after birth (1), throat swab negative (all)
Shaoshuai Wang	1	Weighted 3,205g, Apgar scores at 1 and 5 minutes were 8 and 9, lymphopenia	1	Cord blood and placenta specimens, breast milk, anal swab,	Positive at 36 h after birth

				pharyngeal swab, operative time and at 36 h after birth	
Sascha Ellington	5355	None	None	None	None
Huijun Chen	9	Fetal distress, birth weight of 1,880 g (1), birth weight of 2,460 g (1), a 1-min Apgar score of 8 – 9 and a 5-min Apgar score of 9 – 10 (all), a mild increase in myocardial enzymes creatine kinase-myocardial (1)	6	Amniotic fluid, cord blood, neonatal throat swab, and breast milk	Negative
Nan Yu	7	Outcomes of the neonates (good), the neonatal birthweights and Apgar scores (normal)	3	Not tested for SARS-CoV-2 (4); nucleic acid test for the throat swab	Infected with SARS-CoV-2 36 h after birth (1), negative (2)
Ziyi Yanga	114	Stillbirth (1.2%), neonatal death (1.2%), preterm birth (21.3%), low birth weight (< 2,500 g, 5.3%), fetal distress (10.7%), and neonatal asphyxia (1.2%)	Not reported	Amniotic fluid, placenta, or cord blood	RT-PCR negative
Suliman Khan	**3**	Case 1: Apgar scores of 8 and 9 at 1 minute and 5 minutes, respectively. The neonatal birth weight 2,890 g Case 2: Apgar score of 9 – 10, birth weight of 3,500 g Case 3: Apgar score of 9 – 10, birth weight of 3,730 g	3	In cases 1,2,3: nasopharyngeal swab	In cases 1,2,3: negative for SARS-CoV-2.
Oscar Martɪnez-Perez	82	NICU admission (19)	82	Nasopharyngeal swab obtained for RT-PCR within 6 h of life	Newborns tested within 6 hours after birth had a positive SARS-CoV-2 RT-PCR result. Repeat testing at 48 hours was negative (3), none developed COVID-19

					symptoms within 10 days. Other newborns developed COVID-19 symptoms within 10 days (2)
Yangli Liu	10	Stillbirth (1), newborn infants got a 1-min Apgar score of 10, no severe neonatal asphyxia (9)	No report	No report	No vertical transmission was found.
David A. Schwartz	39 infants (one set of twins)	36 weeks 2 days (4), and weighed less than 2,500 (2), birth weight of 1,880 grams (1) and was delivered to a mother with preeclampsia. Good Apgar scores (all); SGA (29), LGA (1), shortness of breath (6), febrile (2), rapid heart rate (1), gastrointestinal symptoms (4), neonatal respiratory distress syndrome (2), pneumothorax (1), neonatal fatality (1), bacterial pneumonia (3).	30	Placenta, amniotic fluid, umbilical cord blood, gastric juice and throat swabs, urine and feces of the infant. Pharyngeal swab specimens were collected from 9 neonates between 1 and 9 days following delivery and tested for SARS CoV-2	Negative (all), infant diagnosed at 17 days of life (1), infected 36 hours following delivery (1)
Leila Asadi	9	Neonatal Apgar score was 8 - 9 at the first minute and 9 - 10 at the fifth minute, born after 36 weeks of gestation (1), full-term (4), premature (6). Among infants born to mothers infected with CVV, critical score (less than 90) in (PCIS) (6), shortness of breaths (6). Other symptoms observed were fever (2), tachycardia (1), vomiting, nutrition intolerance, bloating, refusal to breastfeed, and gastric bleeding (4) in chest radiographs, infection (4), neonatal respiratory distress	No report	No report	Negative with COVID-19 tests

		syndrome (2), pneumothorax (1). One infant died (1), fetal intrauterine distress (6)			
Cuifang Fan	2	Case 1: weighs 3,400 g and the Apgar scores were 9 and 10 at 1 and 5 minutes after birth. Case 2: The newborn weighed 2,890 g with Apgar scores 9 - 10 at 1 and 5 minutes	2	Immediately after birth there was a failure to detect the SARS-CoV-2 in any of the specimens including newborn's nasopharyngeal swab, maternal serum, placenta tissues, umbilical cord blood, amniotic fluid, vaginal swabs and mother's breast milk	Case 1: low-grade fever and abdominal distension with lymphopenia (16.87%) on day 3. On day 4, chest radiograph revealed diffuse hazziness in both lung fields. Fever and lung infection responded to antibiotics. Case 2: mild neonatal pneumonia and lymphopenia (10.5%), treated with antibiotics

| Christine M Salvatore | 120 | Median gestational age was 38 weeks (range 27 – 41), admitted to (NICU)(12), received routine neonatal care (70). A length of stay of 2 – 4 days (5); reasons for admission were prolonged QT syndrome, mild respiratory distress, and tachycardia. Median length of hospital stay (2 days). | 82 | 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. 53 (65%) of 82 neonates were followed up by telemedicine at 1 month of life; five (6%) missed the scheduled appointment and all the remaining neonates were not yet 1 month of age. One neonate had fever for 1 day of and was evaluated in the emergency department, where blood and urine cultures and repeat SARS-CoV-2 PCR were negative | Neonates were tested at 24 h of life and none was positive for SARS-CoV-2. 82 (68%) neonates completed follow-up at day 5 – 7 of life. 72 (88%) neonates were also tested at 14 days of life and none was positive, blood and urine cultures and repeat SARS-CoV-2 PCR were negative. |
| Latif Panahi | 38 (two were twins) | A neonate died (1) admitted to the NICU ward for monitoring (1), Apgar score of 8 - 10 (all), amniotic fluid abnormality, cyanosis, asphyxia, abortion, or congenital abnormalities at birth (0), tachypnea, milk regurgitation, vomiting, cough, fever, pneumothorax, liver disorders, thrombocytopenia, and pulmonary changes in chest CT scan | 38 | Throat, umbilical cord, amniotic fluid, stool, neonatal blood samples and breast milk of mother immediately after birth for screening of SARV-19 infection via SARS-CoV2 RT-PCR. | Negative |

Farida Elshafeey	256	Neonatal death (1), preterm birth (< 37 weeks of gestation) (39), birth weight ranged from 1520 – 4050 g. Low birth weight (< 2500 g) (20), intrauterine fetal distress (20), admission to NICU (8), neonatal mechanical ventilation (3), respiratory distress syndrome (12), neonatal pneumonia (3), disseminated intravascular coagulation (3), stillbirths (2), early neonatal death (1)	256	The sample in one of the four newborns was collected 36 h after birth. The four newborns recovered and were discharged. Samples were taken from their cord blood, placenta, and amniotic fluid.	RT-PCR positive neonates (4), negative (65), breast milk negative (26), positive IgM (3), positive IgG test (6)
Carina Rodrigues	185	Neonatal death (1), admitted to the pediatric hospital (33), stillbirth (1), preterm births (40)	Not reported	Amniotic fluid, placenta, and/or cord blood analyzed for the SARS-CoV-2 virus were negative (RT-PCR); nasopharyngeal on throat samples were taken from the newborns (n = 1,045); sample collection varying from immediately to 9 days after birth, maternal and neonatal sera samples to test for IgG and IgM antibodies. Nasopharyngeal , anal swabs collected on the second and fourth days after delivery, samples of nasopharyngeal exudates collected between the first two hours and the 16th day of life (5)	Negative amniotic fluid, placenta, and/or cord blood analyzed for the SARS-CoV-2 virus (all) positive for SARS-CoV-2 (7) breast milk (no evidence of SARS-CoV-2) positive RT-PCR for SARS COV-2 throat swab collected at 36 h after birth (1), negative breast milk samples (all); negative results on the sixth day for two newborns and on the seventh day for another; negative five samples (1), high values of IgM and IgG antibodies in the blood at days 1 and 15 after

				delivery (1), high levels of IgM antibodies (2). high values of IgG antibodies with normal levels of IgM (3), reactive for IgM (4)and for IgG (7)

CCV = Coronavirus pediatric system, PCIS = pediatric system, RT-PCR= real-time polymerase chain reaction

SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2,

NICU = Neonatal intensive care unit

PCIS = pediatric system

SGA small for gestational age, LGA = large for gestational age

COVID-19 = coronavirus disease 2019

infections during pregnancy, including SARS-CoV and MERS-CoV (25). In total, 6,569 women gave birth, more often by caesarean than vaginal delivery. The reasons for caesarean included arrest of labour and non-reassuring fetal tracing, arrest of descent, failed labor induction, non-reassuring fetal heart sounds, unidentified risk of intrapartum mother-to-child spread by vaginal delivery, repeated caesarean, arrest of cervical dilation, unclear indication, previous stillbirth, elevated liver enzymes, COVID-19 pneumonia, preeclampsia, placenta previa, abruptio placentae, multiple organ dysfunction syndrome and oligohydramnios (Table 2). The delivery procedure was determined by obstetrical aspects and medical urgency. Because there is no clear proof of vertical transmission in COVID-19 patients, vaginal birth is not prohibited (10). Although the records do not indicate a danger of vertical transmission, prolonged umbilical cord clamping and skin-to-skin contact should be avoided following birth, as per the Canadian Society of Obstetricians and Gynecologists' SARS in pregnancy guidelines (26). COVID-19 causes miscarriage in 2% of cases, intrauterine growth restriction (IUGR) in 10% of cases, and preterm birth in 39% of cases (10). The majority of COVID-19 patients had caesarean deliveries, largely as a result of preeclampsia, fetal distress, previous C-sections as well as the unidentified risk of intrapartum mother-to-child transfer by vaginal birth, according to Fang Z et al. (27). Covid-19-related complications in the Asadi et al. study included fetal distress (3/13), premature rupture of fetal membrane (1/13), and vaginal delivery (1/13), preterm labor between 32 - 36 weeks of gestation (6/13) (28). There were no differences in preeclampsia, gestational diabetes mellitus, or early membrane rupture between COVID-19 and non-COVID-19 groups, according to one case control study (27). Three moms died from COVID-19-related problems after giving birth.

After intubation, one of the moms had a caesarean section, and she died seven days later. Some women were admitted to the intensive care unit (ICU) due to multiple organ dysfunction syndrome (MODS), which includes acute respiratory distress syndrome (ARDS) requiring intubation and mechanical ventilation, acute liver failure, acute renal failure, and septic shock. Despite the low death rate, one of the major problems with COVID-19 infection is the development of acute respiratory distress syndrome, which frequently necessitates intubation and ventilation and is a clinical epiphenomenon of

viral pneumonia (29). According to Khodamoradi, a 36-year-old Iranian woman sought therapy for left shoulder pain and cough 5 days after a scheduled caesarean section. Physicians should be aware that these disorders can arise in postpartum women at the same time (30). The embolus in the Ida Martinelli study had a substantial impact on the patient's clinical condition, prompting an early delivery despite the fact that it was mild and did not worsen coagulation test indications. COVID-19 may induce pulmonary embolism, according to growing data (31). COVID-19 has limited direct data on thromboembolic risk, however, there is evidence of an elevated risk (3/637 hospitalized infected pregnant women in one comprehensive analysis) (32). This risk can be exacerbated by pregnancy, limited mobility, and dehydration. The American Society of Hematology, the Society of Critical Care Medicine, and the International Society on Thrombosis and Haemostasis all recommend routine pharmacologic venous thromboembolism prophylaxis in patients hospitalized with COVID-19 unless there is a contraindication (e.g., bleeding, severe thrombocytopenia) (15). Additional comorbidities included premature rupture of membranes, gestational diabetes, preeclampsia, placental abruption, fetal distress, hypothyroidism, anemia, preterm birth (< 37 weeks), fetal growth restriction, and miscarriage. COVID-19 infection during pregnancy was documented in six studies. There were no reports of miscarriage linked to COVID-19 infection in the first trimester. None of the participants had systemic conditions such as diabetes, chronic hypertension, or cardiovascular disease, according to Huijun Chen et al. Preterm labour occurred in six (46%) of the patients. The virus infection, as well as physiologic alterations that diminished the mother's sensitivity to hypoxia throughout late gravidity, could be blamed for these neonatal problems (33). Some cases, however, appear to be iatrogenic. As a result, it is difficult to say if these results were linked to maternal infection. Other additional comorbidities were: mild intermittent asthma, induced abortion, septic shock, chronic hypertension, thalassemia, polycystic ovary syndrome, valve replacement, type 2 diabetes, suspected viral pneumonia, uterine scarring, gestational hypertension, and influenza. Sebastian Gidlöf described a twin pregnancy compromised by COVID-19 that resulted in severe preeclampsia. This example demonstrates the difficulty in distinguishing COVID-19 from other consequences seen in high-

risk gravidities with comorbidities, such as pulmonary edema/embolism. As a result, in women with high-risk pregnancies, extensive COVID-19 testing should be explored (35). The most prevalent test finding was lymphopenia. Five of the nine pregnant women who tested positive for COVID-19 pneumonia (1.0 x 10^9 cells per L) showed lymphopenia, according to laboratory tests. Six of the patients had a high C-reactive protein level (> 10 mg/L). Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) values were higher in three of the patients (15). Table 1 contains information on the medical features of COVID-19-infected pregnant women in addition to maternal outcomes.

Neonatal outcomes

Outcomes for newborns included neonatal intensive care unit (NICU) admission, prematurity, birth weight lower than 2,500 g, preterm birth (< 37 weeks), fetal distress, and neonatal asphyxia. There were no indications of vertical transmission in any of the babies. Stillbirth and infant mortality, which may or may not be related to the infection, have been documented (Table 3). Caesarean birth was significantly related with elevated incidence of NICU admission in a population in Spain after controlling for confounding factors (36). According to Christine M Salvatore, 83% of COVID-19-positive pregnant women had term babies, with a median gestational age of 38 weeks (27 – 41) (17). In a study of pregnancy outcomes, fetal mortality occurred in 2/11 of the cases, and three of the nine babies were born prematurely (26). According to research, roughly 10% of COVID-19 pregnancies are complicated by intrauterine growth restriction (IUGR) (10). There was no evidence of neonatal asphyxia in the babies. All nine livebirths had a 1-minute Apgar score of 8 – 9 and a 5-minute Apgar score of 9 – 10 (37). The reverse-transcription polymerase (PCR) test, which uses nasopharyngeal swabs or other upper respiratory tract secretions, such as throat swabs or, more recently, saliva samples, has been the most extensively used and reliable test for COVID-19 diagnosis (38). SARS-CoV-2 was detected in amniotic fluid, newborn throat swabs, and breast milk, as well as maternal serum, feces, placenta tissues, vaginal swabs, and umbilical cord samples from patients. According to a retrospective study of COVID-19 in pregnancy, SARS-CoV-2 was not found in any of the women's breast milk (10). SARS-CoV-2 was not

identified in any of the women's breast milk in a retrospective analysis of COVID-19 in pregnancy (39). A term neonate was born to a mother who had a one-day fever and cough when she gave birth, according to Kirtsman et al. SARS-CoV-2 was found in both the parenchymal and chorionic sides of the mother's placental tissue. At delivery, the infant tested positive for SARS-CoV-2 via a nasopharyngeal swab (40).

In nine live newborns, Yangli Liu et al. found no severe newborn hypoxia and no vertical viral transmission (33). The infant was born on February 2 to a mother who tested positive for the virus, according to the local Chinese media (4). Despite a lack of viral isolates in amniotic fluid, cord blood, breast milk, and newborn throat swabs in a subsection of these patients, no documented cases of vertical transmission have been recorded among the 46 additional neonates born to COVID-19-infected mothers thus far (10). All of the babies scored well on the Apgar scale. A positive SARS-CoV-2 nasopharyngeal swab was found in a roughly 35-week pregnant woman who went on to vaginally deliver a live preterm baby, according to Suliman Khan et al. The newborn appeared to be in good health, with Apgar scores of 8 and 9 at 1 minute and 5 minutes, respectively (41). In two other positive COVID-19 cases, caesarean section was performed at 36 - 37 weeks due to persistent fever (38.5° C). At 1 and 5 minutes, the babies weighed 2,890 and 3,400 grams, respectively, and had Apgar scores of 9 - 10. SARS-CoV-2 was not discovered in any of the fetal products or infants (42). In another case, a baby with extended QT syndrome, moderate respiratory distress, and tachycardia was admitted to the NICU. The average length of stay in the hospital for all neonates was roughly 2 days (37).

Limitations

A bigger cohort and a longer period of follow-up with repeat testing and serology may be required to confirm that perinatal transmission is uncommon if sufficient protective procedures are used. Due to the few documented occurrences, substantial diversity in the type of biological material tested, and the time of collection, the evidence is still restricted. We were only able to include data from published studies to make this review possible. We believe that, in the midst of the pandemic, many healthcare facilities may not have had opportunity to discuss

their COVID-19 pregnancy experiences. This review was a massive task, and our findings are only current as of September 7, 2020. The quality of the reports was not evaluated. We recognize that in the event of a virus, the desire to transmit data quickly may have an effect on the quality of the information that are released. There is a chance that some of the primary documents will overlap.

CONCLUSION

COVID-19 illness, according to current evidence, has a clinical picture and intensity identical to those of non-gravid persons, notably fever and cough. Furthermore, COVID-19 in pregnancy was found to be safe in the majority of cases and may not be linked to poor maternal or perinatal outcomes, despite the small number of instances reported. However, because coronaviruses can cause complications for the foetus and infant, such as intrauterine growth restriction, preterm delivery, NICU admission, spontaneous abortion, and perinatal death, obstetricians and perinatologists must be prepared to handle complications, particularly in pregnant women with comorbidities. Vertical transfer of COVID-19 to the foetus is poorly understood. Further studies are required to arrange for more detailed data on maternal and fetal sequelae, as well as the rationale for obstetrical engagement, and the potential hazards and advantages of experimental medicines and vaccinations during pregnancy, as pregnant women and their foetuses are a high-risk demographic during infectious disease epidemics.

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Article info

Ishodi trudnoće sa infekcijom korona virusom (kovid 19)

Nasrin Fazel[1,2], Sina Shahrooyan[2], Shohreh Shahrouyan[3]

¹Iranski istraživački centar za zdravo starenje, Departman za medicinsko hirurško sestrinstvo,
Fakultet za sestrinstvo i akušerstvo, Univerzitet medicinskih nauka u Sabzevaru, Sabzevar, Iran
²PhD u Javnom zdravlju, Univerzitet u Beču, Beč, Austrija
³Moskovski državni univerzitet za medicinu i stomatologiju A. I. Evdokimo, Moskva, Rusija
⁴Hakim Univerzitet u Sabzevaru, Subzevar, Iran

S A Ž E T A K

Uvod. Klinička terapija kovid 19 infekcije u toku trudnoće još uvek je nedovoljna i ograničena. Trenutna literatura o kovid 19 infekciji u toku trudnoće i porođaja sumirana je u ovom radu, sa fokusom na ishode po majku i dete.

Materijal i metode. Od 1. juna do 7. septembra 2020. godine urađeno je sistematsko pretraživanje naslova radova u oblasti medicine (MeSH) u elektronskim bazama Web of Science i Scopus, PubMed, Google Scholar, SID, uključujući ključne reči: virus korone, kovid 19 i trudnoća. Istraživanje i kriterijumi selekcije bili su ograničeni isključivo na literaturu na engleskom i persijskom jeziku. Istraživanje je uključilo radove svih kategorija o kovidu 19 u trudnoći. Takođe, pretraživane su i reference relevantnih studija. Nakon eliminacije dupliranih i nepodobnih radova, sakupljen je ukupno 21 rad.

Rezultati. Pronašli smo 21 studiju sa ukupno 6569 trudnica koje su imale kovid 19 infekciju: samo jedna studija opisala je težinu bolesti: 368 (95,6%) blagih slučajeva, 14 (3,6%) težih slučajeva i 3 (0,8%) ozbiljna slučaja. Ukupno se 6569 trudnica porodilo carskim rezom. Neke trudnice sa sindromom višestruke disfunkcije organa razvile su simptome zbog kojih je prijem u jedinice intenzivne nege bio neophodan. Najčešće terapije kod trudnica sa kovidom 19 uključile su prepisivanje hidroksihlorokina, beklometazona, kalamina, diklofena, metilprednisolona, azitromicina, ganciklovira, kineskih lekovitih biljnih čajeva i oseltamivira. Najčešće opisani simptomi bili su temperatura i kašalj, zatim rinoreja, stezanje u grudima, dispneja, kongestija nosa i mijalgije. Ishodi kod trudnica uključivali su prevremeno pucanje membrane, smrt majke (21), gestacioni dijabetes, preeklampsiju, abrupciju posteljice, fetalni distres, anemiju, prevremeni porođaj (pre 37. nedelje), ograničenje intrauterinog rasta bebe, pobačaj, hipertenziju i grip. Najčešći ishodi kod beba bili su prijem u neonatalnu intenzivnu negu, rođenje pre vremena, porođajna težina od 2500 g, prevremeno rođenje (pre 37. nedelje), nelagodnost fetusa, neonatalna asfiksija, rođenje mrtvog ploda (5) i smrt ploda (9). Sve bebe su imale dobar Apgar skor.

Zaključak: Prenatalni i neonatalni ishodi bili su povoljni u većini slučajeva. Trudnice i bebe treba smatrati posebno osetljivom populacijom u pogledu preventive kovida 19 i strategija lečenja.

Ključne reči: kovid 19, novi korona virus, trudnoća, fetus, novorođenče