Esin Koç and Dilek Dilli*

How does COVID-19 affect maternal and neonatal outcomes?

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Abstract

Objectives: In this article, we aimed to evaluate the most recent information on the impact of the COVID-19 pandemic on the health of mothers and their babies.
Methods: We conducted a literature search by utilizing online sources. Scientific papers that were written in English on the effects of COVID-19 on both mother and their newborn were assessed.
Results: COVID-19 can be fatal, especially in pregnant women with accompanying chronic diseases. The timing and mode of delivery should be decided by the status of the mother and fetus instead of SARS-CoV-2 positivity in pregnant women. At the nursery, routine separation of SARS-CoV-2 positive mothers and their infants is not recommended. However, it is important to take preventive measures to reduce the risk of transmission. The advantages of breastfeeding seem to outweigh the potential dangers of viral transmission. Neonatal COVID-19 infections may cause different clinical pictures from asymptomatic infections to life-threatening diseases. International health authorities specifically recommend that pregnant and lactating women get vaccinated to diminish the risk of transmission of the virus to the mother and fetus, not giving preference to a certain vaccine. It is prudent to apply universal screening only in populations with a high prevalence of COVID-19.
Conclusions: Healthcare professionals should carefully manage the perinatal period during the COVID-19 outbreak, using the most up-to-date information to protect and promote maternal and newborn health. Further scientific studies are needed to clarify the early and long-term effects of the COVID-19 pandemic on maternal-neonatal morbidity and mortality.

Keywords: COVID-19; maternal and neonatal health; pregnancy.

Introduction

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected many people around the world since November 2019 [1, 2]. Although SARS-CoV-2 can infect anybody, including adults, adolescents, children, pregnant women, and newborns, it leads to more severe diseases in older patients with comorbidities [3, 4]. Since the beginning of the pandemic, knowledge about how the virus affects maternal and newborn health has increased considerably (Figure 1).

COVID-19 infection during pregnancy may be associated with preeclampsia, sepsis, disseminated intravascular coagulopathy (DIC), more cesarean deliveries, preterm delivery, maternal death, and neonatal morbidities [5, 6]. It is noteworthy that the signs and symptoms of the disease vary according to socioeconomic status and geographical differences. In this paper, we aimed to assess the recent research on the effects of the COVID-19 pandemic on maternal and newborn health.

Materials and methods

We conducted a literature search by utilizing online sources including PubMed, Scopus, Web of Science, and Google Scholar. The expressions of “COVID-19”, “SARS-CoV-2”, “Maternal mortality”, “Fetal effect”, “Pregnant women”, “Perinatal outcome” and “Neonatal outcome” were searched for “and/or”. Scientific papers written in English between January 1, 2020, and August 31, 2022, on the effects of COVID-19 on both mother and newborn during pregnancy and newborn were assessed. Of these data, only systematic reviews, meta-analyses, clinical trials, retrospective studies, and case series were included in the review. Publications that do not have full texts and that only discuss maternal or fetal outcomes were excluded. We have attempted to showcase a variety of the remaining publications.

***Corresponding author: Dilek Dilli**, Professor of Neonatology, Department of Neonatology, Dr Sami Ulus Maternity and Children Research and Training Hospital, University of Health Sciences of Türkiye, Ankara, Türkiye, Phone: 00 90 312 906 3619, E-mail: dilekdilli2@yahoo.com. https://orcid.org/0000-0003-2634-2562
Esin Koç, Department of Neonatology, Chief of Neonatology Division, Gazi University, Gazi School of Medicine, Chief of Turkish Neonatal Society, Ankara, Türkiye

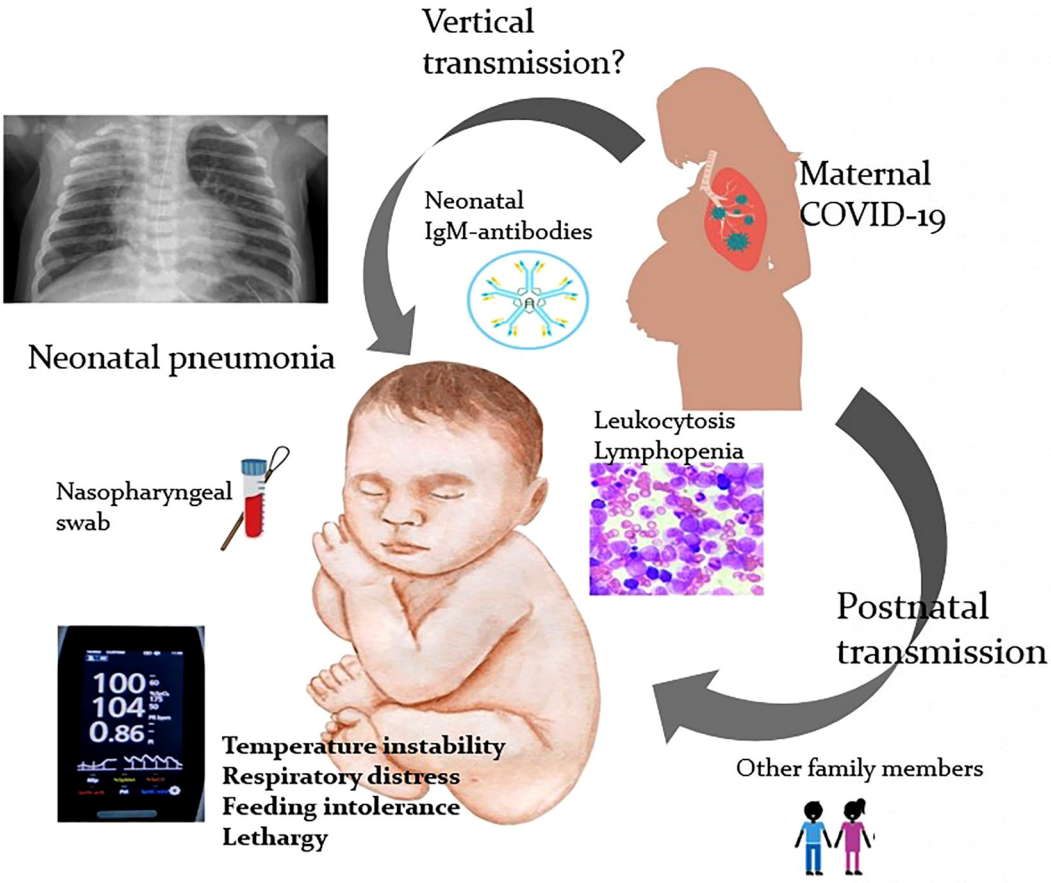


Figure 1: Exposure to COVID-19 throughout the perinatal period, potential clinical symptoms, and laboratory abnormalities in a neonate. COVID-19, novel coronavirus disease 2019; Ig, immunoglobulin; RT-PCR, real-time polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome–coronavirus 2.

Results

COVID-19 pandemic and maternal and neonatal outcomes

Maternal and perinatal health

During pregnancy, many physiological changes affect the respiratory and cardiovascular systems, such as weakened immunity, increased oxygen consumption, decreased lung capacity, and increased risk of thromboembolism. Unfortunately, these changes make pregnant women susceptible to infections [7]. Recent data show that COVID-19 infection in pregnancy has led to maternal pneumonia, premature rupture of membranes (PROM), premature birth, cesarean section, fetal distress, gestational hypertension, gestational diabetes, preeclampsia, oligohydramnios, and sinus tachycardia [8–10].

According to a systematic analysis, the most commonly reported symptoms in pregnant women infected with SARS-COV-2 are fever and cough [11]. A study from Turkey reported that the most common complaints among pregnant women with COVID-19 were fever, chills, weakness, fatigue, myalgia, cough, shortness of breath, and runny nose [12]. In a case series from the USA, serious adverse outcomes such as cardiac dysfunction and respiratory distress requiring intensive care support were reported in pregnant women who were positive for COVID-19 [13]. Gara et al. [14] also described a severe case of COVID-19 in a pregnant woman resulting in acute respiratory distress syndrome, DIC, and preterm delivery.

The virus spreads through the blood to the lungs 7–14 days after the onset of symptoms which can lead to severe hypoxia. Then, the virus initiates its second attack, leading to the worsening of symptoms [15]. As the course of COVID-19 is particularly severe in pregnant women with comorbidities, these cases should be closely monitored [16].

In a study from US hospitals, it was reported that there was a small but significant increase in maternal

complications such as hypertensive disorders, postpartum hemorrhage, and mortality during the COVID-19 pandemic [17]. These findings have increased concerns about the COVID-19 pandemic and pregnancy-related outcomes.

The choice of mode of delivery & fetal outcomes

It has been suggested that the prevalence of cesarean section and preterm birth among pregnant women has increased in the course of the COVID-19 pandemic. However, a meta-analysis of ten studies found that outcomes differed between pregnant women with and without symptoms of COVID-19 infection [18]. Chinese studies had significantly higher rates of cesarean deliveries and unfavorable pregnancy outcomes (91 and 21%) compared to the American (40 and 15%) and European (38 and 19%) studies [19].

According to the INTERCOVID research, pregnant women with COVID-19 had a high preterm birth rate of 22.5% [20]. Wei et al. also showed that SARS-CoV-2 infection was linked to low birthweight, preterm delivery, and stillbirth [21]. It has been suggested that systemic inflammation and cytokine release caused by viral infections may trigger uterine contractions and cause virus-induced modifications in the placenta that are responsible for fetal growth retardation [22].

Recent studies showed that the rates of abortion and premature birth were not significantly increased among the women exposed to COVID-19 infection during pregnancy [23, 24]. In a national survey from Turkey, Urgancı et al. [25] found slight increases in the rates of birth induction, elective and emergency cesarean sections, and small decreases in the rates of preterm delivery and small for gestational age (SGA) birth. Strict restrictions during the COVID-19 pandemic might prevent easy access to healthcare facilities and hinder adequate prenatal care [26, 27]. A study from China showed that miscarriage and preterm birth rates dropped to pre-pandemic levels after pandemic restrictions were lifted [28]. Today, The American College of Obstetricians and Gynecologists (ACOG) advises that SARS-CoV-2 infection alone is not a reason for preterm delivery or a cesarean section and that the timing of delivery should be determined by the maternal and fetal status [29].

How is the virus transmitted to the fetus and newborn?

The virus can transfer to the baby during pregnancy, at birth, or through breastfeeding, contact with the mother, or other caregivers during the early neonatal period [30]. A large-scale study [31] revealed a statistically significant correlation between the duration of intrauterine exposure and the risk of neonatal COVID-19 test positivity. It has been suggested that viremia can cause vascular alterations such as hypercoagulability, poor vascular perfusion, and placental injury which facilitate vertical transmission [32].

The first studies from China showed that perinatal transmission of the new SARS-CoV-2, albeit rare, could occur. This has led to an increase in cesarean delivery rates and routine mother-baby separation after delivery [33]. Currently, the probability of intrauterine SARS-CoV-2 transmission is considered to be low [34]. SARS-CoV-2 infection does not cause viremia, and angiotensin-converting enzyme 2 (ACE2) and transmembrane serine protease 2 (TMPRSS2), which facilitate the entry of SARS-CoV-2 into cells, are not at high levels in the placenta [35, 36]. Many studies have demonstrated the lack of SARS-CoV-2 isolates in infected mother's amniotic fluid, cord blood, breast milk sample, and newborn throat swabs; these results demonstrate that intrauterine transmission is not feasible after vaginal birth or during nursing [9, 23]. The probability of intrauterine transfer is extremely unlikely, but transmission can happen at delivery, thus mothers should be informed about the risk.

Should we screen all pregnant women during the COVID-19 pandemic?

Considering clinical and epidemiological criteria meeting the suspected case classification for COVID-19 in the early stages of the pandemic, the World Health Organization (WHO) recommended a test for SARS-CoV-2 [32]. Given that the coronavirus may infect pregnant women as well, there is debate about whether all pregnant women who apply to the hospital should be subjected to the same testing procedure. To preliminary data, Kumar et al. noted that the admission of such individuals carries a significant risk of transmission to infants, other patients, and healthcare personnel. So, they proposed that widespread screening would guarantee the correct identification of SARS-CoV-2 positive mothers and the isolation of the patients [37]. Later studies showed a high risk of morbidity and mortality, especially among symptomatic pregnant women suggesting not all regions of the world would gain from an extensive screening of expecting women [38, 39]. Currently, ACOG has recommended only in centers with a high incidence that pregnant women undergo universal testing [29].

The safety of COVID-19 vaccination during pregnancy

Several infection peaks have emerged during the COVID-19 pandemic, the majority of which were brought on by SARS-CoV-2 variations [40]. The vaccination of pregnant or

nursing women is strongly advised by the Centers for Disease Control and Prevention (CDC) and ACOG. They have stated that pregnant or nursing women can get any of the immunizations that are currently allowed, without regard to the vaccine's kind [29, 41]. The ACOG also reports that expecting women should be encouraged to discuss their immunization schedule and any concerns they may have with their obstetrical healthcare practitioner. Pregnant women who refuse to be vaccinated should be informed about the importance of maintaining other preventive measures, such as the use of masks and avoiding close mother-infant contact after delivery, if necessary.

Most countries today recommend that pregnant individuals receive an effective covid-19 vaccine against COVID-19; However, vaccination coverage among pregnant women appears to be lower than among women of reproductive age [42].

Neonatal outcomes

Theoretically, due to their undeveloped immune systems, neonates may be more susceptible to severe illnesses. However, research has shown that the clinical signs of SARS-CoV-2 infection in newborns range significantly, from asymptomatic carriage to life-threatening illness. In two high-risk, urban, academic maternity hospitals, Flannery et al.*'s* [33] observational research of perinatal COVID-19 showed that whereas symptomatic perinatal COVID-19 infection had an impact on maternal health and delivery, it had no appreciable impact on newborn health following birth. Preterm delivery, fetal discomfort, intrauterine growth restriction, miscarriage, newborn hypoxia, and perinatal mortality are among the neonatal morbidities associated with COVID-19 [4, 9, 18, 30]. A systematic review of Elshafeey et al. [43], provided findings about stillbirths and neonatal death related to COVID-19.

In a recent large-scale, prospective, international investigation, the authors demonstrated that a diagnosis of COVID-19 experienced during pregnancy affected perinatal and neonatal outcomes, with higher rates of preterm delivery and lower birth weight, length, and head circumference. Additionally, as predicted, there were higher rates of extended NICU stays, fever, gastrointestinal and respiratory issues, and mortality among COVID-19-positive neonates of mothers with COVID-19 diagnoses compared to neonates who tested negative [31].

Another interesting set of data relates to full-term newborns and the impact of maternal COVID-19. In the study by Zgutka et al. [44], the infants delivered to COVID-19-positive mothers were more likely to exhibit feeding intolerance. This knowledge is beneficial to physicians since it implies that full-term COVID-19 babies will have a clinical trajectory that is comparable to that of other full-term babies. Mothers of babies who have feeding issues frequently experience psychological discomfort. Informing mothers about the greater likelihood of feeding issues before delivery may aid them in coping with some of the anxiety that comes with these issues.

The most significant sources of information on pandemics are experiences, which are also highly helpful for healthcare workers on the ground. Each year, more than a million babies are born in Turkey, and the Turkish Neonatal Society (TNS) provided evidence-based recommendations for the care of neonates who have SARS-CoV-2 infection [45].

To breastfeed or not to breastfeed during the COVID-19 pandemic

During breastfeeding, the baby receives the proper nutrients from the mother while also receiving anti-infective and anti-inflammatory factors. Therefore, international health organizations advise encouraging mothers with suspected or confirmed COVID-19 to start or maintain breastfeeding, as its advantages outweigh any possible hazards of viral transmission [29, 32].

According to a systematic review, there was no increase in breastfeeding-related late postpartum transmission (defined as occurring after 72 h of life). Nevertheless, when infants were not kept apart from their infected mothers after delivery, a higher risk of late postnatal transmission was detected [46]. It is important to balance this potential increased risk with the benefits of mother-infant bonding and the low risk of serious infant sickness. The majority of recommendations encourage a mother who has the infection for rooming-in with her infant, particularly if she is asymptomatic and without a fever [31, 32].

Some hospitals have adopted policies that discourage immediate skin-to-skin contact or keep the neonate isolated from mothers with COVID-19 diagnosis, especially early period of the pandemic. Recent research on neonatal care practices revealed that immediate skin-to-skin contact and rooming-in did not increase the risk of neonatal test positivity in centers where mothers used masks and washed their hands before touching their newborns and the hospital staff used gloves and masks [47].

A Neo-Covid Research Group was created in Turkey by TNS to examine the clinical and epidemiological characteristics of COVID-19 in mother-baby pairs at 34 NICU facilities [48]. The majority of infants born to COVID-19-positive mothers were observed for a period in NICU isolation rooms, while some were observed two meters away or received

family care in a different room. In the early stages of pandemics, most babies were fed formula or breast milk that had been expressed because there was a dearth of knowledge regarding the safety of breastfeeding. Indeed, according to the most recent evidence, an infected mother's milk is a source of anti-SARS-CoV-2 IgA and IgG that may neutralize the virus' activity and protect the newborn from contracting the disease and its more severe symptoms. Therefore, it is highly advised to continue breastfeeding while using the proper infection control methods.

Discussion

A summary of recommendations for maternal-neonatal care during the COVID-19 pandemic [29, 32, 45].

- Only pregnant women in centers with a high incidence of COVID-19 should undergo universal testing.
- Pregnant women can obtain the COVID-19 vaccine, to limit the risk of this virus to the mother and fetus. Despite high vaccination rates all over the world, it is still important to minimize contact and take other preventive measures, such as keeping a physical distance, since the prevalence of SARS-CoV-2 mutations varies around the world.
- SARS-CoV-2 infection alone is not a reason for preterm delivery or a cesarean section and the timing of delivery should be defined by the maternal and fetal status.
- Routine separation of mother and newborn is not advised as the physiological advantages of breastfeeding and skin-to-skin contact outweigh the probably negligible risk of transmission from mother to newborn, particularly in light of the low virulence within the neonatal population.
- The majority of SARS-CoV-2 transmission to neonates during and soon after birth occurs through respiratory droplets. By using infection prevention techniques, the risk of this transmission can be decreased.
- The breastfeeding decision should be given individually according to the health status of the mother and the baby, and mothers should be encouraged for breast milking even after being separated from their babies. During breastfeeding, all precautions should be taken, including careful hand washing and wearing a face mask, which are now universal recommendations.
- Health workers need to better manage the perinatal period during the COVID-19 pandemic, utilizing a variety of comprehensive information to safeguard and enhance mother and newborn health.
- Even though neonatal infections are rare, the probability of vertical transmission cannot be eliminated. Clinicians should perform effective strategies to prevent or reduce risks of the virus to mothers, fetuses, and neonates.
- Further original studies evaluating maternal and neonatal outcomes of COVID-19 in pregnancy with longer follow-up periods are needed.

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