Breastfeeding in a COVID-19 world

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Purpose of review
The coronavirus disease 2019 (COVID-19) pandemic has changed the birthing and postnatal experience of women. This review highlights how policy changes have affected pregnant and breastfeeding women, the evidence for continued breastfeeding and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccines, and how the pandemic's unexpected consequences have affected these women's wellbeing. Additionally, we postulate the future of lactation and perinatal support as the pandemic continues.

Recent findings
Women who have given birth during the pandemic have had restricted access to postnatal care. Although pregnant and breastfeeding women who contract SARS-CoV-2 are more vulnerable to poor health outcomes than their nonpregnant counterparts, they are also at higher risk of mental health difficulties, with limited access to support. Continued breastfeeding may be protective to the infant, offering passive immunity against SARS-CoV-2, and vaccination against COVID-19 is safe and effective for pregnant and lactating women. Innovative and adaptable lactation care, including holistic perinatal, mental health, and social support services, both digital and in-person, will help mothers continue breastfeeding during future outbreaks.

Summary
Continued breastfeeding and vaccination may confer protection to the infant against SARS-CoV-2 infection. New mothers should not be isolated in future pandemics. Prioritizing lactation and perinatal care, including in-person services, remains paramount to optimizing breastfeeding during COVID-19.

Keywords
breastfeeding, coronavirus disease 2019, mental health, severe acute respiratory syndrome coronavirus 2, vaccination

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has severely impacted the health and wellbeing of pregnant and breastfeeding women. A combination of biological, social, and cultural constructs has placed them at greater risk of suffering from the immediate effects of the virus and the longer-term unforeseen consequences of the pandemic. Pregnant and breastfeeding women are physiologically more likely to become severely ill from coronavirus disease 2019 (COVID-19) infection than their nonpregnant counterparts. During the pandemic, rapidly integrated health policies have further affected how women give birth and establish breastfeeding. Women's access to medical care, social and mental health support has also been affected. This review highlights the timeline of changes affecting pregnant and breastfeeding women, the evidence for continued breastfeeding and SARS-CoV-2 vaccines, and how the pandemic's unexpected consequences have affected these women's wellbeing. In addition, we consider the future of lactation and perinatal support as the pandemic continues.

CORONAVIRUS DISEASE 2019 POLICIES FOR PREGNANT AND BREASTFEEDING WOMEN

COVID-19 has changed the birthing and postnatal experience of women globally [1▪▪,2▪▪]. Due to the initial uncertainty about vertical transmission of SARS-CoV-2, strict policies were rapidly

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Curr Opin Clin Nutr Metab Care 2022, 25:188–194
DOI:10.1097/MCO.0000000000000821

KEY POINTS

- Many women who have given birth during the coronavirus disease 2019 pandemic have received restricted postnatal care due to health policies that aim to reduce the risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission.
- There is limited risk of transmission between mother and infant during pregnancy, birth, breastfeeding, or rooming-in when public health hygiene measures are followed.
- Breastfeeding may confer protection against SARS-CoV-2 via secretory immunoglobulin A antibodies transferred in human milk from both infected mothers and after vaccination.
- Although pregnant and breastfeeding women are at increased risk of ill health from SARS-CoV-2, they are also at significant risk of poor mental health, and wellbeing which may further affect their breastfeeding choices.
- Supporting breastfeeding women with continued inperson and digital health services is essential as the pandemic continues.

implemented to prevent mother-to-infant transmission early in the pandemic. Underpinned by scant evidence, many policies negatively impacted pregnant and breastfeeding women with suspected infection, typically requiring them to labour without extra support people and be separated from their newborn at birth. Partners were restricted from visiting the hospital, and women were discharged early. Some hospitals extended these policies to all birthing women. Changes to maternity care occurred in high, low, and middle-income countries (LMIC) alike. In a survey assessing frontline workers' experience of the maternal and newborn services during the pandemic, health professionals across 81 countries highlighted that woman experienced reduced access and frequency of antenatal services, in-person visits, and support people allowed after birth. Telemedicine was also more frequently utilized, although women living in LMICs reported the highest barrier to accessing this service [2▪▪,3]. Similar findings were shown in European-based hospital surveys of health professionals, reporting a shorter postpartum stay, and limited parental access to infants in neonatal intensive care (NICU) [1▪▪]. Other studies have shown that families received conflicting information on whether direct breastfeeding was safe. Once at home, breastfeeding women experienced reduced access to lactation and mental health support [4▪,5,6]. The combination of restrictive policies, misinformation, and lack of evidence complicated the provision of human milk (HM) and maternal-infant bonding during the early months of the pandemic [7▪▪].

Such practices contrast the relatively early recommendations adopted by the World Health Organization and others to protect and promote continued breastfeeding during the pandemic [8–10]. Global recommendations emphasized the importance of establishing breastfeeding, rooming-in, and skin-to-skin contact [8,9]. Mothers who are SARS-Cov-2 positive and are well enough should continue breastfeeding or expressing milk, rooming-in, and caring for their newborn while adhering to appropriate infection-control measures such as hand hygiene and wearing a mask [9]. Infection control practices effectively reduce the transmission of SARS-Cov-2. In a US-based study, there were no cases of maternal-to-infant transmission after 14 days amongst families who implemented appropriate infection control measures while rooming-in or breastfeeding [11▪]. Findings from longitudinal studies in the UK [12] and Israel [13] have reaffirmed that since neonatal infection is unlikely, SARS-Cov-2 positive mothers should not be separated from their infants.

CORONAVIRUS DISEASE 2019 TRANSMISSION FOR PREGNANT AND BREASTFEEDING WOMEN

Pregnant and recently pregnant women are more likely to get severely ill from COVID-19 than nonpregnant women [14,15▪▪]. Pregnancy causes changes in the body that make it easier to become unwell from respiratory viruses like SARS-Cov-2. These changes can persist after birth, potentially heightening the risk for breastfeeding women. Indeed, an analysis of over 400 000 women with symptomatic SARS-Cov-2 infection showed that pregnant women had a three-fold increased risk of being placed in intensive care, 2.9 times increased risk of mechanical ventilation, and 1.7 increased risk of death compared their nonpregnant counterparts [15▪▪]. Pregnant women with severe infections are also at increased risk of preterm birth, pregnancy loss, and neonatal morbidity [14,16▪▪].

Although pregnant women are at greater risk of infection, vertical transmission of the virus from mother to infant is rare during pregnancy, birth, and lactation [5]. Registry data from more than 9500 births in the United States suggest vertical transmission after delivery occurs in approximately 2% of infants born to SARS-Cov-2 positive mothers [10]. Other data support these findings reporting either no transmission [17,18] or single cases of probable transplacental or intrauterine transmission during

pregnancy and labour, respectively [14,19–21]. No reports of transmission have been demonstrated via HM [17,22▪,23]. Although viral RNA has been isolated in some HM samples of SARS-Cov-2 positive mothers, none contained replicant-capable SARS-Cov-2 [22▪,23–26,27▪▪].

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 SPECIFIC SECRETORY IMMUNOGLOBULIN A PROTECTION IN HUMAN MILK

Strong evidence shows that antibodies to SARS-Cov-2 isolated in HM have an immunological response against the virus. After maternal SARS-Cov-2 infection, antibody isotypes measured in HM include sIgA/IgA, secretory immunoglobulin M (sIgM)/IgM, and secretory immunoglobulin G (sIgG)/IgG [27▪▪,28,29▪▪,30]. The most abundant sIgA shows robust neutralizing activity specific to SARS-Cov-2 [27▪▪,28,29▪▪,30]. HM samples of infected women have demonstrated that sIgA and IgG activity persists for up to 5 months postinfection in milk and maternal serum, respectively. While sIgA levels in milk generally declined slightly over time, maternal serum samples of IgG were unchanged [3]. SARS-Cov-2 specific sIgA was not detected in several samples of mothers who tested positive for SARS-Cov-2 but were asymptomatic, indicating they had a low viral load. Additional studies have shown SARS-Cov-2 specific IgG in serum samples of lactating mothers up to 8 months postinfection [25,31].

HM sIgA protects against pathogens that can cause respiratory and gastrointestinal illness by neutralizing viruses and preventing bacterial adhesion to the infant's mucosal surfaces [32]. Therefore, it is highly likely that after maternal infection, breastfeeding offers a level of passive immunity to the infant through SARS-CoV-2 specific sIgA [33▪▪]. Whether this protection reduces SARS-CoV-2 infection through vertical transmission or direct or indirect contact with others is unclear. Evidence from enteric [34] and influenza viruses suggests so [35]; however longitudinal observational studies of SARS-CoV-2 positive breastfeeding women and their infants are required to elucidate the specific role of SARS-CoV-2 sIgA in infant immune protection.

CONTINUED FEEDING IN THE NEONATAL INTENSIVE CARE SETTING

An important consideration is breastfeeding and feeding expressed milk to hospitalized sick and pre-term infants during the pandemic. Studies show when active SARS-CoV-2 is added to HM, holder pasteurization (62.5°C for 30 min) inactivates the virus. Therefore, feeding holder pasteurized donor HM can be considered safe in NICU [22▪,28,36]. In this notion, the continuation of breastfeeding and skin-to-skin or kangaroo mother care (KMC) during the pandemic also extends to the NICU setting. Data show that KMC and breastfeeding during COVID-19 are essential to neonatal survival, particularly in LMIC. Statistical modelling of LMICs revealed that at a hypothetical vertical transmission rate of 10%, universal KMC (99% coverage, including skin-to-skin care and breastfeeding) for infants weighing <2000 g would benefit infant survival 650 times that of the mortality risk from SARS-CoV-2 infection. This strategy could save an estimated 125 680 neonatal lives over 12 months of the pandemic [37▪▪]. With COVID-19 hygiene measures implemented, feeding fresh mother's own milk or pasteurized donor milk for sick infants in the NICU is safe.

SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2 VACCINATION DURING LACTATION

Although more than fifty SARS-CoV-2 vaccine candidates reached clinical trial stages, none were initially inclusive of pregnant or breastfeeding populations [38], resulting in a substantial knowledge deficit concerning vaccination safety for these women [39]. Once vaccinations became available, national bodies neither recommended nor excluded vaccination during pregnancy and lactation, leaving women to decide on the COVID-19 immunization based on their individual health circumstances. Many women were confused by mixed messages from their health providers and respective governments and hesitant to receive the vaccination. Since then, international evidence has confirmed the safety and efficacy of vaccination against SARS-CoV-2, and it has become universally recommended for pregnant and breastfeeding women.

Multiple efficacy-based studies have demonstrated that mRNA-based vaccination of pregnant and breastfeeding women results in the secretion of SARS-CoV-2 specific neutralizing activity of IgA and IgG provided via the placenta and HM [40,41▪▪,42▪▪,43–45]. Minimal adverse effects of mRNA vaccines and no serious adverse events have been reported for the breastfeeding mother or infant. A small percentage of women reported a transient reduction in their milk production following the first dose, which returned to prevaccination levels within 72 h [46]. Additionally, safety data and prospective registries following women vaccinated in pregnancy have found no adverse outcomes for the pregnancy or foetus [47,48]. The overwhelming evidence indicates that pregnant and breastfeeding

women should continue to be routinely offered vaccination against SARS-CoV-2, which not only protects the mother but may also confer protection to the infant via the transfer of antibodies in HM. The duration of the antibody response to SARS-CoV-2 in HM after vaccination is yet to be clarified. Interestingly, women breastfeeding longer than 24 months appear to have higher immunoglobulin concentrations in response to vaccination than women who breastfeed for shorter periods [43].

EFFECT OF CORONAVIRUS DISEASE 2019 ON MATERNAL WELLBEING

Despite the abundance of evidence supporting breastfeeding, lactation and perinatal mental health support must be prioritized during the pandemic. New mothers are already at increased risk of mental health issues. Postpartum physiological and psychological changes affect maternal mental health and increase the risk of psychological stress, anxiety, and depression. Before the pandemic, 10–20% of perinatal women experienced mental health problems. Research during the COVID-19 pandemic has since shown exceptional rates of anxiety and depression amongst pregnant and postpartum women across Europe, North America, China, and Australia [49,50,51▪▪,52,53]. Such findings highlight the need for clinical protocols and resources to ensure screening and treatment for perinatal anxiety, depression, and stress during the pandemic.

Some mothers have stated that the pandemic has triggered positive changes, including less pressure and more partner support to continue breastfeeding [50,51▪▪,54]. Others have highlighted that reduced access to support has caused their early weaning [51▪▪]. Individual circumstances and the types of restrictions implemented may also play a role in women's breastfeeding choices. For instance, Australian and New Zealand women that experienced lockdown for more extended periods of their pregnancy were more likely to cease exclusive breastfeeding [54]. They also had poorer mental health outcomes, as did women living in regions with higher COVID-19 infection rates [54]. Similarly, in a sample of UK women [51▪▪], 41% felt that breastfeeding was protected. In comparison, 27% struggled to get support, with some citing the pandemic as their reason for stopping breastfeeding earlier than planned. This occurred if they gave birth during lockdowns, they were living in challenging circumstances, with lower levels of education, or from minority ethnic backgrounds. Such evidence highlights that we must consider the mothers' personal experience and home life during the pandemic and how it may affect their breastfeeding choices differently when individualizing lactation care [55].

PERINATAL SUPPORT MOVING FORWARD IN THE PANDEMIC

The importance of support on maternal wellbeing has been strongly emphasized both before and during the pandemic [53]. During the pandemic, low scores of family function have been associated with poorer mental wellbeing in Australian breastfeeding women [54]. Data from the US has reinforced the importance of comprehensive family networks and breastfeeding support services during COVID-19 [6]. Mothers highly valued in-person emotional support via family and peer networks and informational support via in-person lactation services. Lockdowns caused reductions in all forms of in-person support, resulting in increased stress and smaller social support networks amongst mothers. Therefore, it remains critical that in-person community efforts are maintained for maternal-infant health visits. Furthermore, determining how best to provide virtual support is required when in-person visits are impossible [6]. New, evidence-based, and forward-thinking support measures are needed to ensure these women have continued access to support.

Several strategies have been proposed to help women across different stages in pregnancy and lactation during the pandemic (Table 1) [7▪▪]. Lactation telehealth services, including digital applications, telephone, mobile phone, and video conferencing, have been demonstrated to be equally effective and feasible in higher and lower-income populations. However, it is unclear if telehealth lactation programs are consistently associated with improvements in breastfeeding rates. Understanding if telehealth services versus standard in-person services support long-term breastfeeding outcomes requires further investigation [56].

Online antenatal breastfeeding education has a similar potential to become accredited and standardized [7▪▪]. During the COVID-19 pandemic, many face-to-face programs were either cancelled or rapidly brought online. It has become clear that women should have access to breastfeeding education across all delivery modes to suit their needs, including online prerecorded modules, smartphone applications, and in-person training whenever possible [7▪▪]. Furthermore, validating and testing online education modules may be prudent in ensuring the health professionals can effectively teach all practical components of birthing and lactation online.

In the case of maternal and infant separation, while ensuring physical visitation is critical,

Table 1. Future lactation services, benefits, risk and requirements

Lactation support strategies	Method	Benefits	Risks	Future requirements
Teleheatlh	Application, telephone, mobile, video conferencing	Increased access to lactation care during outbreaks, and for people living in rural locations	Unregulated online clinical IBCLC practice across countries	Implemented into standardized IBCLC and lactation training models
Online Antenatal education	Application, telephone, mobile, video conferencing	Opportunity to receive antenatal education with low risk of transmission	Practical topics concerning birthing and breastfeeding require adaption to online models of teaching	Accreditation and evaluation of online courses
Connected NICU services	Application, mobile, video conferencing	Increased visual contact between families and infant, access to nurse and infant health charts	Reduction in visits if able to virtually feel connected	Testing user requirements (NICU parents and health workers) before app development
Contactless milk delivery	Application, mobile, QR scanning, comprehensive milk drop off and milk bank team system	Low transmission risk when dropping milk to the NICU	Costly infrastructure to set up	Model milk bank/NICU test set-ups to demonstrate the feasibility
Supportive network bubbles	Rapid antigen testing, vaccination to ensure safe access to services	Low transmission risk while ensuring social connections and health services maintained	Difficult to enforce without local government policy	Financial investment and lobbying local governments for support
Comprehensive wellbeing services	Mental health services, social welfare, and access to family leave	Ensures holistic care is accessible for new families to continue breastfeeding	Requires government policy and significant financial investment	Lobbying national governments to financially support maternity and family leave

IBCLC, international board certified lactation consultant. NICU, neonatal intensive care unit.

connecting mothers, families and their infants virtually is also possible in some settings. For example, low transmission risk rooms in the NICU setting, such as dedicated visitation rooms or single rooms, maybe beneficial to minimize the exposure between visitors. Smartphone applications that may enable 24/h video streaming access to the baby, nurse contact, and contactless expressed milk delivery services have potential in high-equipped settings [7▪▪]. However, policies that ensure families have access to their infant for skin-toskin care during the pandemic remain an essential first step in many institutions.

Isolating mothers is not the answer for future outbreaks or pandemics. Although digital healthcare is likely to remain critical, in-person support will always remain paramount for breastfeeding mothers needing assistance during the early days and a sense of connection for wellbeing. Small support bubbles or groups can be established that enable the mother and caregiver confidence in accessing health services and mothers' groups, such as rapid COVID-19 antigen testing, vaccination requirements, and standardized hygiene practices. Although these practices may have already informally introduced in many countries, limited legislation supports new mothers, specifically during the pandemic.

Finally, although not unique to the pandemic, ensuring that women have access to comprehensive wellbeing services is vital [7▪▪]. Lactation care clearly must be linked to relevant support that includes mental wellbeing and social welfare, including services that assist with financial stability, job opportunities, and childcare [7▪▪]. Similarly, having access to paid maternity and family leave adaptable in times of lock-downs and self-isolation may assist families' wellbeing and enable the continuation of breastfeeding.

CONCLUSION

The COVID-19 pandemic has highlighted and increased the disparities new mothers already face during birth, after-care, and when establishing lactation. Breastfeeding during the pandemic remains an essential public health priority to ensure optimal health outcomes and possible protection from the virus of all infants and children. Prioritizing mental health and adaptable lactation care, including

digital and face-to-face services and support, will help ensure that women can continue breastfeeding now and into the future of the pandemic.

Acknowledgements

None.

Financial support and sponsorship

The present research was funded by an unrestricted research grant from Medela AG (Switzerland).

Conflicts of interest

D.T.G and S.L.P. receive funding from an unrestricted research grant from Medela AG, administered by the University of Western Australia

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