

REVIEW ARTICLE

Obstetrics

COVID-19 guidelines for pregnant women and new mothers: A systematic evidence review

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Abstract

Background: Nearly a year after COVID-19 was initially detected, guidance for pregnant and new mothers remains varied.

Objective: The goal of this systematic review is to summarize recommendations for three areas of maternal and fetal care—breastfeeding, post-partum social distancing, and decontamination.

Search strategy: We searched PubMed, Embase and Web of Science spanning from inception to November 9, 2020.

Selection criteria: Articles were included if they focused on COVID-positive mothers, commented on at least one of the three areas of interest, and were published in English.

Data collection and analysis: Our combined database search yielded 385 articles. After removing duplicates and articles that did not cover the correct populations or subject matter, a total of 74 articles remained in our analysis.

Main results: Most articles recommended direct breastfeeding with enhanced precaution measures. Recommendations regarding post-partum social distancing varied, although articles published more recently often recommended keeping the mother and newborn in the same room when possible. Decontamination recommendations emphasized mask wearing, good hand hygiene, and proper cleaning of surfaces.

Conclusion: In general, there was a focus on shared decision making when approaching topics such as breastfeeding and post-partum social distancing. Guidelines for decontamination were fairly uniform.

KEYWORDS

breastfeeding, COVID-19, post-partum care, pregnancy, skin-to-skin contact, SSC

1 | INTRODUCTION

The first case of COVID-19 was detected in Wuhan, China, on November 17, 2019.¹ Cases have since multiplied across the globe, and on March 11, 2020, the COVID-19 outbreak was declared a

pandemic by the World Health Organization (WHO).² The pandemic has since spread across the globe, leading to over 105 million cases and nearly 2.3 million deaths at the time of writing.³

Now, nearly a year after the first case of COVID-19, there remains much to learn about the virus. As a result, guidelines

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for new mothers, both with and without COVID-19, are varied. Uncertainty in best practices carries tangible ramifications for both maternal and neonatal health. For example, early in the pandemic, there was concern that a COVID-19 positive mother could transmit the virus to her child through vertical transmission mechanisms (such as breastfeeding), although it is now understood that COVID-19 is spread primarily through horizontal transmission via aerosolization.^{4,5} In comparison, the benefits of breastfeeding—particularly its ability to protect children against infectious diseases through the direct transfer of antibodies—are well established.⁶

Mothers also need guidance on how to use personal protective equipment (PPE) and social distancing to protect themselves and their children from COVID-19 in the immediate post-partum period and once they leave the hospital. For infected mothers, questions have been raised regarding how to best broach skin-to-skin contact (SSC) outside of breastfeeding. However, even for those mothers without confirmed COVID-19, information is needed to help improve their experience during delivery and the post-partum period, to ensure that they, their children, and other caregivers remain safe.

The objective of this systematic evidence review is to evaluate all available recommendations regarding breastfeeding, decontamination, and post-partum social distancing for new mothers during the era of COVID-19. Our goal is to (a) provide a summary of what has been learned since the first case of COVID-19 was identified and (b) to provide succinct recommendations to support clinicians and government officials shaping policies for patients.

2 | MATERIALS AND METHODS

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines in our approach to study collection and quality assessment.⁷ We searched PubMed, Embase and Web of Science from inception to November 09, 2020. Search terms included Medical Subject Headings and free-text terms related to COVID-19 and mothers, newborn babies (Supporting Information). An article met inclusion criteria if its primary subject was COVID-positive mothers and if it made recommendations on at least one of the following three areas of management in the postpartum period: breastfeeding, mother-infant social distancing, and decontamination. Additionally, articles had to be published in English. No other explicit inclusion criteria were used in the full text review screen. If articles could not be evaluated based on their abstract, the full text was reviewed for complete determination.

Once the final list of articles was selected, all information related to recommended practices and/or guidelines were extracted and summarized by three authors (CE, SS, MZ) into an Excel (Microsoft, Redmond, WA, USA) spreadsheet. The extracted information was then reviewed and verified by the two co-first authors (MD, SO). The variables of interest were likelihood of vertical transmission and

breastfeeding best practices (for breastfeeding); recommendations regarding SSC, rooming in of the mother and newborn while in the hospital, guidelines on visitors, and guidelines on discharge planning (for post-partum social distancing); and precautions for providers, waste disposal, equipment management, patient transport, aerosolizing procedures, decontamination of work surfaces, and precautions for mothers and infants (for decontamination).

Finally, the quality of guidelines was assessed using the “Appraisal of Guidelines for Research and Evaluation II” (AGREE-II) tool.⁸ The final results were reviewed by the complete list of review authors for accuracy.

3 | RESULTS

Our combined database search of PubMed, Embase, and Web of Science found a total of 385 articles. Additionally, we found six articles through individual author searches. Thirty-two duplicate articles were removed. Through abstract review, an additional 217 articles were excluded as they did not cover the correct populations or subject matter. Upon full-text assessment of the remaining 142 articles, 68 additional articles were excluded as they did not make recommendations on any area of our focus. This resulted in a final list of 74 articles included in our analysis (Figure 1).

3.1 | Breastfeeding

A total of 73 of the final 74 articles discussed guidelines for breastfeeding during the COVID-19 pandemic and were therefore used in the final review (Table 1). The articles included a range of publication types spanning from systematic evidence reviews or narrative reviews with suggested guidelines, to single-site case-reports. Additionally, there was a range of article authorship spanning from international organizations such as the WHO and International Federation of Gynecology and Obstetrics (FIGO) to specific countries’ health guidelines to practice recommendations from individual clinicians.

The primary concern for breastfeeding by COVID-positive or suspect mothers is viral transmission to the newborn via breast milk. Across our included articles, many agreed that transmission via breast milk is unlikely while a smaller proportion felt evidence was lacking to make meaningful assessment. Many early publications cited a study by Chen et al., which was one of the first publications to directly assess for possible vertical transmission of COVID-19.⁸¹ Their group collected multiple samples from six women (including breast milk, amniotic fluid, cord blood and neonatal throat swabs) who delivered and were known to be COVID positive. All six samples of breast milk were tested and negative for evidence of the virus. As we have continued to learn more, vertical transmission through breast milk does appear highly unlikely as suggested by the United States Centers for Disease Control (CDC).⁹

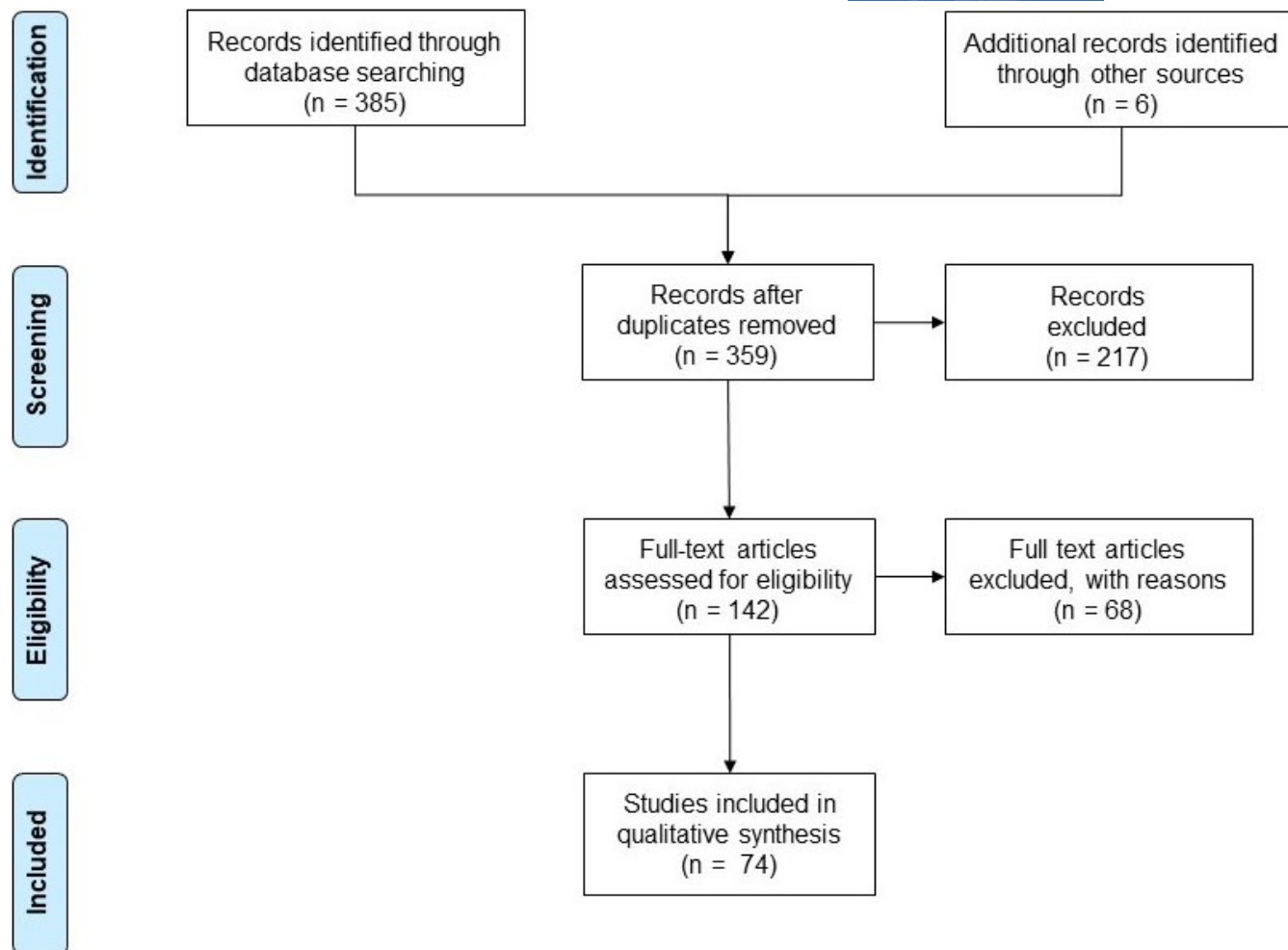


FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram

International healthcare communities have adopted varying recommendations for breastfeeding based on interpretation of the above limited evidence. Most articles, including those by the Royal College of Obstetricians and Gynecologists (RCOG), FIGO, and the WHO, supported direct breastfeeding for mothers with suspected or confirmed COVID-19 infection, with enhanced precautions for mothers well enough to do so.¹⁰⁻¹² Enhanced precaution features included mask usage, strict hand hygiene, breast cleaning, breast milk expression via a dedicated pump with thorough pump cleaning, and feeding of pumped milk to the newborn by a healthy caretaker. Many articles that supported direct breastfeeding indicated that expressed breast milk could be used as an alternative for mothers with more severe symptoms. Alternatively, fewer organizations and author groups recommended strict mother-child separation and dedicated use of alternative milk such as from a donor or formula feeding.⁸¹ Finally, multiple groups, including the CDC, took a nuanced approach to recommendations that were rooted in shared decision making and situational considerations to create a feeding plan that works best for both the mother and her newborn. Typically, the clear benefits of breast milk were presented alongside a neutral presentation of direct versus expressed breast milk versus alternative milk use.⁹

3.2 | Post-partum social distancing

From the original database searches, we identified 53 articles that discussed social distancing guidelines for post-partum during the COVID-19 pandemic, all of which were included in the final review (Table 2). The articles cited include systematic evidence reviews, narrative reviews with suggested guidelines, and single-site case-reports. The range of article authorship spanned from international organizations to specific countries health guidelines to practice recommendations from individual clinicians.

The recommendations regarding the separation of mother and child in cases of suspected or confirmed COVID-19 infection varied widely amongst the articles. Some articles recommended routine separation of the mother and newborn immediately after birth regardless of either the mother or the child's symptoms.⁶⁸ Others specified that separation should occur only if either the mother or child was symptomatic or had symptomatic contacts, or if the infant was high-risk because they were pre-term or had required care in the neonatal intensive care unit.^{13,69} For those recommending separation, the length of isolation time varied, with the longest being 14 days.¹⁴

TABLE 1 Summary of breastfeeding recommendations

| Topic | Prevention measures | Studies (reference number) |
|--|--|---|
| Vertical transmission through breastmilk | Appears unlikely | 1,9–52 |
| | Cannot be ruled out and/or limited evaluation of likelihood | 53–67 |
| | Did not comment | 68–80 |
| Breastfeeding of COVID+ or suspected mothers: primary recommendations and other considerations | Primarily encouraged to directly breastfeed | 10–13,15,17–20,24–26,28,29,33,35–38,41,42,45–47,49,51,55,56,65–67,70,71,73,74,76,78 |
| | Primarily encouraged use of expressed breastmilk | 1,14,39,40,62 |
| | Primarily encouraged to abstain from use of any breast milk during set infectious period | 27,30,32,43,54,58,60,61,69,72,75 |
| | Primary recommendations non-specific for either direct breastfeeding or use of expressed breastmilk | 59 |
| | Primarily encouraged to make plan through shared decision making with parents | 9,16,21,31,44,47,50,52,53,57,64,68 |
| | Use of expressed breastmilk typically only if maternal or fetal status prevents direct breastfeeding | 10,11,13,15,17,18,24,28,29,35,38,41,42,45–47,49,56,65–67 |
| | Recommendation of direct breastfeeding vs use of expressed breastmilk based on presence or absence of symptoms, minimum time afebrile, etc | 22,23,34,63,77,79,80 |
| | Consider infant feeding through use of a healthy caretaker if mother is symptomatic | 1,14,21,24,29,34,39,40,49,50,52,56,65,66,68,74 |

However, while some advocated for routine separation of mother and child immediately after birth, some major national and international health organizations did not, particularly as more knowledge was gained about COVID-19 and the need to balance the risks and benefits of COVID-19 prevention with breastfeeding, SSC, and maternal-infant bonding. The Italian Society of Neonatology felt that routinely separating mother and child may be futile because exposure could have already occurred in the pre-symptomatic phase.¹⁵ The WHO felt that the benefits of breastfeeding and SSC outweighed the risks of COVID transmission and recommended that mothers and infants room in together even if one of them had COVID-19.¹² RCOG states that the decision to separate a mother and child should be shared between the mother and the clinical team rather than mandated, and this type of shared decision making is also supported by the American College of Obstetricians and Gynecologists (ACOG) and the CDC.⁵³ However, if the mother chooses to have her newborn room in with her after birth, most organizations recommend having a physical barrier such as a curtain and at least a two-meter distance between the mother and child to prevent the spread of COVID-19.^{16,53}

In addition to concerns about breastfeeding and physical distancing outlined above, there has also been debate on SSC. Some earlier recommendations stated that SSC between mother and the newborn should be suspended to prevent COVID-19 infection.¹⁷ However, later recommendations, including those of WHO, have advocated for SSC. This is likely because SSC has many benefits such as increased newborn temperature regulation, increased initiation of breastfeeding, and mother–newborn bonding, all of which can affect the mental and physical well-being of both the mother and the newborn.¹⁸

It was also recommended that the amount of time that the mother and infant remained hospitalized be limited to minimize infection risk. Hospital discharge should ideally occur 24 h after vaginal delivery and 48–96 h after cesarean section.^{17,19,70} It was also recommended to limit the number of visitors both in the hospital and in the post-partum period at home. Some recommendations regarding ways to limit contacts include speaking to one's employer about minimizing COVID-19 exposure and conducting post-partum follow-up via telehealth if feasible.^{20,21,70}

3.3 | Decontamination

We identified 39 articles that discussed guidelines for decontamination of both the healthcare setting and the home, all of which are included in the final review. Like the articles in the other sections, the papers included systematic evidence reviews, narrative reviews with guidelines, expert group guidelines, and single-site case-reports. The range of article authorship spanned from international organizations to specific countries health guidelines to practice recommendations from individual clinicians. The full listing of final articles and their findings are listed in Table 3.

For all hospital births during the COVID-19 pandemic, decontamination practices should be discussed with families both during and following the birth.⁸³ During the hospitalization, appropriate PPE should be worn by both patients and healthcare workers. N95s are suggested during any aerosol-generating procedures including supplemental oxygen use, intubation, and forceful pushing.^{22,70} In keeping with viral precautions, those cleaning labor and isolation wards must be provided with appropriate PPE, and all equipment

TABLE 2 Summary of post-partum social distancing recommendations

| Topic | Prevention measures | Studies (reference number) |
|---|--|------------------------------------|
| Delivery room practices | Do not delay cord clamping | 14,58 |
| | A family member can be in the delivery room at birth if he or she is asymptomatic | 37 |
| Skin-to-skin contact (SSC) | No SSC in the delivery room | 16 |
| | No SSC in patients with COVID-19 | 17 |
| | Shared decision making about SSC | 62 |
| | Immediate SSC if medically appropriate | 12,26,50 |
| | Early SSC regardless of COVID-19 status | 18,20,29,48 |
| Guidelines for isolation of mother and newborn | Separate mother and newborn post-partum regardless of COVID-19 status (duration up to 14 days) | 40,68,72 |
| | Separate mother and newborn until the mother is fully recovered or confirmed not to have COVID-19 | 30 |
| | Separate if either is symptomatic or had symptomatic contacts | 22,36 |
| | Separate mother and newborn if mother is COVID positive and newborn is COVID negative (duration up to 14 days) | 14,34,54,58 |
| | Infected mothers with two consecutive negative COVID tests should isolate another 14 days before reuniting with their newborn | 61 |
| | High risk, symptomatic, pre-term, or infected infants should be isolated for 14 days | 38,62,69 |
| | Separate mother and newborn if the newborn is critically ill | 13,21 |
| | Separate mother and newborn if the mother is critically ill | 10,13,18,28,35,55,65,82 |
| Guidelines for shared decision making about rooming in | Consider separation if the mother is COVID-positive and the newborn is COVID-negative, but use shared decision making | 53,56,62,63 |
| | Decision to separate vs room mother and newborn together should be made on a case-by-case basis | 1,11,13,15,51,57,63,67,73,74,78,80 |
| Guidelines that encouraged rooming in of mother and newborn | Mother and newborn should room in together even if one of them has COVID-19 | 12 |
| | Rooming in allowed for mothers without severe or critical COVID-19 and healthy newborns | 17,20,24,50,65 |
| | Do not separate the mother and the newborn from each other if both are COVID-negative | 58 |
| | Mothers and newborns can stay in the same room if they are asymptomatic and are separated (distance varied from 1 to 2 m) | 16,18,20,25,34,47,50,51,53,80 |
| Visitors | Mothers discharged before their newborn may visit if their symptoms are improving, >7 days have passed since symptoms began, or they have had two negative tests >24 h apart | 39 |
| | Only mothers may visit the postpartum unit. They may do so 14 days after testing positive and if afebrile for >72 h | 26 |
| | Parents can visit daily (no limits on duration) | 20 |
| | Restrict contact to one family member | 42 |
| | Parent visits cancelled during COVID-19 outbreak | 43 |
| Hospital discharge planning | Discharge should occur 24–28 h after vaginal delivery and 48–96 h after C-section | 17,19,70 |
| | Socially distance from those outside family | 1,36,46,70 |
| | Limit contact with COVID-positive people at work | 21 |
| | Conduct post-partum visits via telehealth | 20,29,46,70 |

and surfaces must be properly disinfected by either autoclaving or use of appropriate solutions such as 70% ethyl alcohol sanitizers for hand washing and hydrogen peroxide or sodium hypochlorite for large surfaces and disinfection of wards in between patients.^{9,23,24}

Stable newborns should be bathed as soon as possible after birth to remove potential viral particles present in secretions on the skin, particularly if the mother has suspected or confirmed COVID-19.^{22,68} Breastfeeding mothers should wash their hands and wear a three-ply

TABLE 3 Summary of decontamination recommendations

| Topic | Prevention measures | Studies (reference number) |
|-------------------------------------|--|---|
| Precautions for providers | Wear all garments until arrival in the NICU. Remove gloves and aprons in the patient's room and remove caps, glasses, and masks in the anteroom | 22 |
| | Surgical masks should be worn in high-risk areas | 28 |
| | Appropriate PPE (waterproof gowns, gloves, surgical or N95 mask, goggles) should be worn during all interactions, including invasive procedures | 17,23,57,64,69 |
| Waste disposal | All COVID-related waste should be disposed of in the same way as any infectious medical waste | 69 |
| | Dispose of medical waste in a double layered bag | 33,64 |
| Equipment | Each patient should have their own dedicated medical equipment | 69 |
| Patient transport | A dedicated transport isolette should be cleaned before/after use while mother and newborn are separated | 68 |
| | Staff escorting the newborn to the neonatal unit should consider wearing full airborne precaution PPE and changing before they leave the delivery area | 76 |
| Aerosol precautions | Aerosol generating procedures (supplemental oxygen, intubation, and forceful pushing) should be avoided. When they occur, wear an N95 | 70 |
| | Wear PPE with newborns needing oxygen | 22 |
| | Patients should quarantine in negative pressure ID wards, airborne infection isolation rooms, or a ward with an independent air circulation system | 43 |
| | Patient's door should be closed during and shortly after any aerosolizing procedure | 57,64 |
| | Aerosol-generating procedures should not be performed in the patient's room | 17 |
| Decontamination of work surfaces | Clean surfaces, equipment and instruments with chemical disinfectants or use autoclaving | 23 |
| | Acceptable disinfectants are 0.5% sodium hypochlorite, 70% ethyl alcohol, hydrogen peroxide, or a chlorine-containing preparation spray | 24,69 |
| Precautions for mothers and infants | Mothers should perform hand hygiene before and wear surgical mask while touching the newborn | 1,9-11,17,20,21,25,26,34,35,38,41,42,45,46,48,50,53,56,57,62,63,65,66,73,74,80,81 |
| | Clean breasts, breast pump and bottle before/after feeding | 9,11,13,21,46,54,56,66,81 |
| | Use a single use pump or leave a dedicated breast pump at the hospital | 9,56,57,74 |
| | Bathe newborn as soon as possible to remove virus from the skin | 34,68 |

Abbreviations: NICU, neonatal intensive care unit; PPE, personal protective equipment.

surgical mask before touching their babies.^{9-11,17,20,21,53,81} If a breast pump is used, the mother's breasts, breast pump, and bottle should be cleaned before and after feeding.^{9,11,13,21,54,81}

3.4 | Risk of bias assessment

The results of the AGREE-II tool on article quality assessment can be found in Table S1. Of the 74 articles, five articles did not have this tool applied to them as these articles were primary literature (quality improvement projects, retrospective chart reviews, etc.) that while providing brief recommendations, were not primarily guideline-producing articles.^{25,26,71-73} The highest scoring category was "Scope and Purpose" at 85%. Most articles provided clear descriptions of overarching article goals, focal health questions addressed and the population of interest. The only other category with an average over 70% was "Clarity of Presentation" at 73%.

Notably, the "Rigor of Development" category carried an average score of 31%.

4 | DISCUSSION

Nearly a year after the first case of COVID-19 was detected, much has been learned and much remains to be known regarding the virus. Our review found varied recommendations across all three focus areas. This is unsurprising given that direct evidence remains limited. Still, as more information has been gleaned through this first year, our review noted gradual cohesion that developed within most recommendation areas across author groups.

Regarding breastfeeding, it is now better understood that COVID-19 is primarily transmitted through aerosols and that decontamination of surfaces is a vital part of infection prevention. Most articles found in our review, particularly those more recently

published, felt that vertical transmission through breast milk remains unlikely (Table 1). This was reflected in our findings with direct breastfeeding with enhanced precaution measures being the most promoted primary recommendation, including from major organizations such as the WHO and RCOG to independent physician groups.¹⁰⁻¹²

Recommendations regarding separation of the mother and newborn after birth varied. However, given the benefits of SSC and breastfeeding, many governmental and professional organizations such as the CDC, ACOG, and RCOG, advocated for shared decision making between patients and providers when considering separation of the mother and newborn in the immediate post-partum period (Table 2). For mothers and newborns who roomed in together, it was generally recommended that a two-meter distance and a physical barrier remain between them when the newborn was not being held.^{16,53} Timely discharge from the hospital, social distancing from those outside immediate family, and telehealth were also recommended to reduce COVID exposure in the post-partum period.^{17,19,70}

Decontamination practices universally advocated for the use of proper PPE by healthcare workers, mothers, and anyone visiting the newborn (Table 3). There was also an emphasis on how proper infection precautions—particularly around aerosol generating procedures—are vital to making breastfeeding and SSC safer for the mother, the newborn, and any close contacts visiting them.^{22,70} These precautions included the use of appropriate techniques such as autoclaving and/or solutions such as hydrogen peroxide or sodium hypochlorite to disinfect surfaces, as well as leaving any required equipment, such as breast pumps, in the hospital to decrease the risk of infection.^{9,23,24,69,74}

There are several limitations to this review. First, the literature on COVID is changing rapidly, and our search period for this study ended on November 9, 2020. It is therefore possible that some of these recommendations will be outdated by the time this study is published. However, summarizing prior recommendations is important to understand how the pandemic was previously managed, and helps provide the context for how recommendations can be changed going forward. Second, as noted in our AGREE-II results, many of the recommendations summarized in this review are not thoroughly evidence-based, but instead were formulated by expert opinion. This resulted in an average score of 31% across articles for the developmental rigor of published guidelines. There was often limited description of systematic methods for evidence collection and poor explanation for guideline formation practices. While we noted gradual cohesion in recommendations over time, significant future study is necessary to better root recommendations in high-quality evidence. Finally, the study period ended prior to the first COVID-19 vaccine doses being given to patients. Even though there were only small numbers of pregnant women in the initial vaccine studies, the CDC has stated that people who are pregnant may choose to be vaccinated, particularly if they are essential workers who are a higher risk of contracting the virus.⁸⁴ Overall, the CDC advocates for the patient and the provider to make a shared decision regarding vaccination during pregnancy. The CDC does include mothers that are breastfeeding in the group of people

recommended for vaccination, stating that mRNA vaccines are not thought to be a risk to breastfeeding newborns.

In reviewing the existing literature, we recommend that shared decision making between the patient and provider be used when determining the type of care provided to both the mother and the newborn. It is of paramount importance to consider the parents' wishes, and to provide them with the most up-to-date information on COVID-19 and its risks, particularly given how rapidly our knowledge of COVID-19 is changing. However, while the decision making ultimately lies with the parents and providers, we strongly encourage direct breastfeeding and co-habitation of the mother and newborn in the immediate post-partum period. The literature suggests that while vertical transmission of COVID-19 is possible, it is a rare mechanism that at this time appears highly unlikely, and that paying attention to horizontal transmission is of critical importance. For this reason, we recommend the use of enhanced precaution measures such as surgical masks and good hand hygiene when engaging in SSC, as well as breast cleaning and the use of a dedicated pump when breastfeeding. It is our hope that the guidelines reviewed and summarized in this paper can support clinicians and government officials creating policies for patient care.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

The concept for this article was conceived by MD, SO, CY, and CP. The protocol was drafted by MD and SO. Literature screening, data extraction, and quality assessment were done by MD, SO, CE, SS, and MZ. All authors contributed to the analysis, interpretation, and the write-up. The article represents the views of these authors only, and not the views of their institutions.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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