

Optimising mother-baby contact and infant feeding in a pandemic

Rapid review Version 2

24th June 2020

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Acknowledgements

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Midwives Information and Resource Service, MIDIRS

Other members of the RCM Professors Advisory Group; Soo Downe, Billie Hunter, Tina Lavender, Helen Spiby

Summary

Optimising close, ongoing contact between mothers and newborn infants and enabling women to breastfeed/feed with breastmilk, or to use breastmilk substitutes as effectively and safely as possible, are key elements of maternity and neonatal care. They are especially important during the COVID-19 pandemic. Extensive evidence-based positive developments in policy and practice to promote and support mother-baby contact, attachment, and breastfeeding have been implemented across maternity and neonatal care in the UK and many other countries in the last 15-20 years, though such changes have not been universally implemented and barriers still exist in many settings. The coronavirus pandemic and the inevitable focus on reducing infection has disrupted many of these positive developments and adversely affected mother-baby contact and infant feeding in many contexts, augmenting existing barriers. Societal changes such as hygiene measures and social distancing, lockdown, isolation, fear, and food security challenges complicate the lives of women and families. Health service changes in the UK and other countries have included virtual contact between women and staff, increased separation of mothers and babies, restrictions on parental visiting in neonatal units, the use of masks and personal protective equipment, staff redeployment and shortages, and the interruption of Unicef UK Baby Friendly Initiative accreditation programmes. Taken together, these changes pose a risk to immediate, close and loving contact between the mother and newborn infant and with the other parent and the wider family, to the initiation and continuation of breastfeeding, and to future individual and family well-being and public health. Some reports are emerging about potential positive impacts of the restrictions on postnatal visiting and increased levels of virtual contact for some families in some countries.

In the context of the COVID-19 pandemic and the need to prevent or reduce infection, this rapid analytic review considers:

- What is the evidence base and best practice on optimising mother-baby contact?
- What is the evidence base and best practice on optimising infant feeding?
- What are the implications of this knowledge for guidance for health professionals, the care of women and babies, and information for women and families?

Summary of key findings and recommendations

1. While the possibility of vertical transmission cannot be completely ruled out, at the time of writing (24th June 2020) there is no conclusive evidence of in utero transmission, and there are no conclusive reports of transmission of coronavirus in breastmilk. It is essential to continue to keep this situation under review.
2. To minimise infection risk, all parents and carers should be encouraged to observe strict hygiene measures.
3. Suspected or confirmed COVID-19 positive infants and infants who have been in contact with suspected or confirmed COVID-19 positive mothers, but who are otherwise well, should not be cared for in neonatal units where the risk of infecting caregivers and immune compromised infants is high.
4. Minimising the number of caregivers the infant is exposed to is essential to reduce the infection risk both for the infant and for the caregivers.

5. Special attention is needed for women in BAME groups.
6. Separating mothers and babies is an intervention with serious consequences and it should be avoided unless essential.
7. There are no grounds for separating asymptomatic, healthy mothers and newborn infants.
8. The establishment of close and loving relationships and avoiding unnecessary separation of mother and baby is likely to help to protect against the anxiety, fear, and other mental health challenges of lockdown and the pandemic.
9. Parents who are asymptomatic should not be required to wear masks when interacting with their baby.
10. Mothers with suspected or confirmed COVID-19 should be supported and enabled to remain together with their infants when the mother is well enough, and to practice skin-to-skin/kangaroo care.
11. Unless one of the parents has suspected/confirmed COVID-19 both parents should be able to be present in the neonatal unit at all times, and should be viewed as partners in care, not visitors, and opportunities for kangaroo care should be maximised.
12. For a mother who has suspected or confirmed COVID-19 and whose baby needs to be cared for on the neonatal unit, a precautionary approach should be adopted to minimise any risk of mother-to-infant transmission; while at the same time, taking steps to involve parents in decisions and to mitigate potential problems for the baby's health and well-being and for breastfeeding and attachment.
13. Detailed guidelines for staff and services on infant feeding in the current context should be implemented and consistently used to optimise care and to avoid inconsistent and inaccurate information for women.
14. Regardless of infant feeding method, all women need ongoing close contact with their babies and information and support with feeding until they are confident and the infant is feeding effectively.
15. Appropriate postnatal contacts and referral systems should be in place for all women and infants.
16. It is important to seek the views of women and staff about effective, context-specific ways of enabling women to breastfeed, to maximise the use of breast milk, and to minimise the risks of breastmilk substitutes in this current crisis.
17. Breastfeeding is strongly recommended for all women and newborn infants.
18. The unique value of breastfeeding to newborn infants, women, and public health especially in this pandemic should be recognised and highlighted by health professionals, policy makers, and the public.
19. Information and support, psychological and practical, should be available to all women in pregnancy and from the first feed onwards to enable them to initiate and continue breastfeeding, including breastmilk expression.
20. Sensitive conversations about infant feeding should be conducted with all women, and should include information, encouragement and support to consider breastfeeding.
21. Women and babies should be enabled to stay together, to have skin-to-skin contact, and to breastfeed responsively.
22. If mother's own milk is not available or where it needs supplementation, donor human milk is the option of choice, especially for vulnerable infants.

23. Women who have suspected, probable or confirmed COVID-19 should be enabled and supported to breastfeed.
24. When a woman is not well enough to care for her own infant or where direct breastfeeding is not possible, she should be supported to express her breastmilk by hand expression or by pump, and/or be offered access to donor breast milk. All feeding equipment and pumps should be appropriately cleaned and sterilised before use.
25. Accessible resources for women will be needed to inform and enable them to breastfeed, especially those from communities where breastfeeding rates are normally low and where effective interventions will be needed to enable them to start and to continue to breastfeed.
26. Parents who formula feed need information and support to enable them to bottle feed responsively and effectively.
27. Health professionals should be alert to any local problems with food security and the supply of infant formula, bottles and teats, and sterilising equipment.
28. Supporting families to claim their Healthy Start vouchers will help them to overcome some of the logistical challenges and purchase adequate supplies of formula and to access Healthy Start vitamins.
29. Accessible resources for staff will be needed to enable them to inform and support women and to have appropriately sensitive conversations with women.
30. All staff working in maternity and neonatal care need support.
31. As the current crisis abates strategies will be needed to ensure that previous evidence based services that have been put on hold or amended are not lost, but instead are reinstated and developed further, based on the best possible evidence.

Background and context

The importance of mother-baby contact and breastfeeding

Optimising close, ongoing contact between mothers and newborn infants and enabling women to breastfeed/feed with breastmilk or to use breastmilk substitutes as effectively and safely as possible, are key elements of maternity and neonatal care. There is a wealth of existing evidence that mother-baby contact and breastfeeding both have an important positive impact on short, medium, and long-term outcomes for both women and newborn infants, including mortality, health, wellbeing, attachment, and development outcomes (Acta Paediatrica, 2015; Rollins *et al.*, 2016; Victora *et al.*, 2016). They contribute to close mother-baby and family relationships that lay a foundation for the survival, health and wellbeing of the baby into childhood and adult life (Schore, 2001; Shonkoff *et al.*, 2012; McManus and Nugent, 2014; National Institute for Health and Clinical Excellence, 2017; Clark *et al.*, 2020; UNICEF, 2020).

Skin-to-skin contact, both immediate and ongoing, has physiological as well as psychological benefits for all newborn infants (Moore *et al.*, 2016). For preterm, small, and sick newborn infants, kangaroo care is associated with reduced mortality as well as improved health outcomes (Conde-Agudelo and Díaz-Rossello, 2016).

Breastfeeding/feeding with breastmilk improves short, medium and long-term outcomes for both infants and women, and the World Health Organisation and UNICEF recommend exclusive breastfeeding for six months and thereafter with other foods for two years and beyond (<https://www.who.int/nutrition/topics/global-breastfeeding-collective/en/>).

Breastfeeding/feeding with breastmilk optimises the immune system, confers active and passive immunity, and protects against infection (Bode *et al.*, 2014; Gomez-Gallego *et al.*, 2016; Victora *et al.*, 2016). This includes protection against life-threatening conditions for preterm, small and sick infants including necrotising enterocolitis, sepsis, and pneumonia (Cacho, Parker and Neu, 2017; Lewis *et al.*, 2017; Woodman, 2017). Infant feeding rates are strongly socio-economically patterned. Women and newborn infants from population groups already likely to be more vulnerable to coronavirus are least likely to breastfeed, contributing to the cycle of nutritional deprivation (Dykes and Hall Moran, 2006; McAndrew *et al.*, 2012; National Institute for Health and Clinical Excellence, 2014).

Existing practice developments and challenges

Extensive evidence-based positive developments in policy and practice to promote and support mother-baby contact, attachment, and breastfeeding have been implemented across maternity and neonatal care in the UK and many other countries in the last 15-20 years, though such changes have not been universally implemented and barriers still exist in many settings (Davies, 2013, 2015; Leadsom *et al.*, 2013; Public Health England and Unicef UK Baby Friendly Initiative, 2016). These include immediate, uninterrupted, and ongoing skin-to-skin contact at birth, early initiation of breastfeeding, and supporting close and loving relationships for all women and newborn infants. For babies in neonatal units and their families, positive developments that are being implemented, though again not universally, include family-centred care, kangaroo care, maximising breastmilk intake, and parents as

partners in care with unrestricted access to their babies (Yu and Zhang, 2019). Multidisciplinary staff education and training in infant feeding remains a challenge however, and women and newborn infants do not reliably receive consistent care and support (Schmied *et al.*, 2011; McAndrew *et al.*, 2012; Yang *et al.*, 2018). Unicef UK Baby Friendly Initiative (BFI) standards for maternity and neonatal services, health visiting services, early years settings, neonatal units, and university pre-registration midwifery and health visiting programmes have been key in promoting evidence-based practice (Entwistle, 2013; Unicef UK Baby Friendly Initiative, 2019), as have national maternity and neonatal policies in all four UK countries (Department for Health, Social Services, 2013; NHS England, 2016; The Scottish Government, 2017; Department of Health and Social Services, 2019; Welsh Government, 2019). All babies in Scotland and Northern Ireland are now born in a BFI-accredited environment, whereas in England this is only 52% (Unicef UK Baby Friendly Initiative, 2020a). In 2019, NHS England published their Long Term Plan (NHS England, 2019) which recommends that all maternity and neonatal services implement BFI accreditation, highlighting that breastfeeding rates compare unfavourably with other countries in Europe, with substantial variation across England: 84% of children reported as breastfed at 6-8 weeks in London compared to 32% in the North East.

Changes resulting from the current pandemic

The coronavirus pandemic and the inevitable focus on reducing infection has disrupted many of these developments across the UK and other countries and has adversely affected mother-baby contact and infant feeding, augmenting the barriers that still exist (Unicef UK Baby Friendly Initiative, 2020b). Mother-baby contact has been reported as being reduced or stopped in some contexts (Baker, 2020; Brown, 2020; Vogel, 2020). Forty percent of UK infant feeding services in a recent (unpublished) survey reported that their staffing has reduced as a result of the COVID-19 pandemic, and 30% report that parental access to the neonatal unit is now 'very restricted' (Unicef UK Baby Friendly Initiative, 2020b). This affects women and newborn infants whether in the community or hospital, whether infected with coronavirus or not, whether the newborn infant requires care in the neonatal unit or not, and at every stage of the continuum, in pregnancy, birth, and after birth. Health service changes have included reducing contact between mothers and babies, service re-design including virtual contact, use of masks and personal protective equipment (PPE), staff redeployment and shortages (Royal College of Midwives, 2020b) and the interruption of BFI accreditation programmes (Unicef UK Baby Friendly Initiative, 2020a). Societal changes including hygiene measures and social distancing, lockdown, isolation, and financial and food security challenges further complicate the lives of women and families. Taken together, they pose a risk to immediate, close and loving contact between the mother and newborn infant and with the other parent and the wider family, to the initiation and continuation of breastfeeding, and to future individual and family well-being and public health.

Some anecdotal reports are emerging about potential positive impacts of the restrictions on postnatal visiting (https://www.mumsnet.com/Talk/breast_and_bottle_feeding/3910633-Impact-of-lockdown-on-infant-feeding). Some women, their partners, and newborns are reported as having more uninterrupted time together, which may be of benefit to women in supportive home situations.

At the time of writing (24th June 2020) the available data on the potential for in-utero transmission of COVID-19 are reassuring, though it cannot be ruled out. There are no conclusive reports of transmission in breastmilk. Existing data are considered in this review.

Review questions and aims

In the context of the coronavirus pandemic and the need to reduce infection:

- What is the evidence base and best practice on optimising mother-baby contact?
- What is the evidence base and best practice on optimising infant feeding?
- What are the implications of this knowledge for a) guidance for health professionals, b) care of women and babies, c) information for women and families?

For each of these questions, this review will consider:

- clinical, psychological, social, and cultural aspects of safety
- the specific needs of:
 - healthy women and babies
 - women with suspected/actual SARS-CoV-2 infection
 - babies needing care in neonatal units (preterm, small, sick) and their parents

These overarching questions require consideration of related issues including:

- Optimising maternal and newborn outcomes
- Reducing/preventing infection for women, newborn infants, families, staff
- Maintaining essential aspects of quality in a time of health service, social, and economic turbulence
- Maximising workforce capacity and capability
- Optimising staff health and wellbeing
- Identifying novel or additional forms of care delivery or modifications in care

Core principles for quality care of women and newborn infants in a pandemic

A set of core principles for quality care of women and newborns in a pandemic have been developed to inform the series of rapid evidence review to inform RCM/RCOG, RCPCH and related guidance. They draw on evidence of essential components of quality care for all women and newborn infants (Renfrew *et al.*, 2014) and incorporating the latest information from the World Health Organisation (World Health Organisation, 2020e, 2020b), the International Confederation of Midwives (International Confederation of Midwives, 2020b, 2020a) and the Royal College of Midwives and the Royal College of Obstetricians and

Gynaecologists on COVID-19 (Royal College of Midwives and Royal College of Obstetricians and Gynaecologists, 2020):

- Continue to provide evidence-informed, equitable, safe, respectful, and compassionate care for physical and mental health of all women and newborn infants, wherever and whenever care takes place
- Protect the human rights of women and newborn infants
- Ensure strict hygiene measures, and social distancing when possible
- Maintain community services and continuity if possible
- Ensure birth companionship by the women's own chosen companion (who should be free of COVID-19 symptoms)
- Prevent unnecessary interventions
- Enable close contact between mother and newborn infant from birth
- Promote, enable, and value breastfeeding/breastmilk feeding and support women to breastfeed
- Involve women, families, and staff in co-designing and implementing changes
- Monitor the impact of changes including assessment of unanticipated consequences
- Protect and support maternity and neonatal staff and students, including their mental health needs

Specific additional principles related to mother-baby contact and infant feeding in a pandemic for all maternity and newborn services draw on the evidence identified in this review, World Health Organisation recommendations (World Health Organisation, 2020a) and the work of the Unicef UK Baby Friendly Initiative (Unicef UK Baby Friendly Initiative, 2020b):

- Provide information and support for all women to optimise contact with their baby, and infant feeding
- Minimise the risks of using breastmilk substitutes especially at this time of heightened risk
- Involve parents as partners in care and promote attachment and close and loving family relationships

Methods

This was a rapid review. Timing precluded a full systematic approach. A structured and transparent approach was used.

Our searches were supported by resources collated by Unicef UK Baby Friendly Initiative the British Association of Perinatal Medicine, and the Human Milk Foundation. Specific searches conducted by MIDIRS used the following databases: Maternity and Infant Care, Pubmed, The Cochrane Library, NICE and the Pan American Health Organization (PAHO) 'COVID-19 guidance and the latest research in the Americas'. Key words used are shown in the Appendix. The last date of the structured searches was 26th May 2020; informal updates continued until 23rd June 2020.

Key findings and recommendations

Relevant studies, reviews, comments and guidelines are shown in Table 1.

Infection risk

1. ***While the possibility of vertical transmission cannot be completely ruled out, at the time of writing (24th June 2020) there is no conclusive evidence of in utero transmission, and there are no conclusive reports of transmission of coronavirus in breastmilk. It is essential to continue to keep this situation under review.*** A systematic review of 49 studies including 666 newborn infants and 655 women (K.F. Walker *et al.*, 2020) concluded 'Neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother'. This is confirmed by a Scientific Brief from the World Health Organisation (World Health Organisation, 2020a). Larger cohorts are needed for adequate investigation. Further work is required on the reliability of amniotic testing for the virus, and for the significance of virus specific antibodies in neonatal blood and breastmilk.
2. The newborn infant may become infected after birth. COVID-19 appears to be a fairly minor illness in young infants and may be asymptomatic (Knight *et al.*, 2020; Zeng *et al.*, 2020; Royal College of Paediatrics and Child Health, 2020). ***To minimise infection risk, all parents and carers should be encouraged to observe strict hygiene measures,*** including hand washing with soap and water before and after contact with their baby, and washing surfaces around the home regularly with soap and water. Women with suspected or confirmed COVID-19 should practice respiratory hygiene and wear a mask when handling the baby. (World Health Organisation, 2020b). If a fluid-resistant surgical face mask is available, this should be considered while feeding and caring for the baby (Royal College of Obstetricians and Gynaecologists, 2020)
3. ***Suspected or confirmed COVID-19 positive infants and infants who have been in contact with suspected or confirmed COVID-19 positive mothers, but who are otherwise well, should not be cared for in neonatal units where the risk of infecting caregivers and immune compromised infants is high.*** Infected infants will be potentially infectious and there are concerns that illness could potentially be more severe in preterm or otherwise immune compromised babies (Zeng *et al.*, 2020; Royal College of Paediatrics and Child Health, 2020). They should be kept with their mothers in situations where women can practice effective hygiene measures and self-isolation; at home if the mother is well enough, or in a side ward.
4. ***Minimising the number of caregivers the infant is exposed to is essential to reduce the infection risk both for the infant and for the caregivers*** (Stuebe, 2020). Keeping newborn infants with their mothers is key to this.
5. Evidence is emerging that the BAME population is more susceptible to COVID-19 (Kirby, 2020; Knight *et al.*, 2020). There are increased rates of mortality in women and babies from these groups, and ***special attention is needed for women in***

BAME groups in regard to promoting contact and enabling women to breastfeed, as well as being vigilant about preventing infection and taking pro-active measures to avoid all forms of discrimination.

Mother-baby contact

6. **Separating mothers and babies is an intervention with serious consequences and it should be avoided unless essential** (Stuebe, 2020; World Health Organisation, 2020b; World Health Organisation Euro, 2020). It causes physiological stress in the baby (Morgan, Horn and Bergman, 2011; Moore *et al.*, 2016; UNICEF, 2020) and the mother (Strathearn *et al.*, 2012) and may make the infant more vulnerable to severe respiratory infections, including SARS-CoV-2, in the first year of life (Galton Bachrach, Schwarz and Bachrach, 2003; Davanzo *et al.*, 2020).
7. **There are no grounds for separating asymptomatic, healthy mothers and newborn infants.** Immediate and uninterrupted contact should be encouraged, including skin-to-skin/kangaroo care, and women and newborn infants should be kept together thereafter (Scottish Government, 2020; World Health Organisation, 2020b, 2020a; World Health Organisation Euro, 2020).
8. **The establishment of close and loving relationships and avoiding unnecessary separation of mother and baby is likely to help to protect against the anxiety, fear, and other mental health challenges** resulting from the pandemic, lockdown, isolation, and other constraints (Charpak *et al.*, 2017).
9. Visual face-to-face interaction with parents is important for newborn brain development and attachment (Simion *et al.*, 2011). **Parents who are asymptomatic should not be required to wear masks when interacting with their baby.** If women have suspected or confirmed COVID-19, they should wear a mask when handling the baby (Royal College of Midwives and Royal College of Obstetricians and Gynaecologists, 2020; World Health Organisation, 2020e) but should be enabled to remove it and interact visually with the baby at a safe distance - ensuring that staff also remain at a safe distance - to avoid transfer of the virus by droplets (World Health Organisation, 2020d).
10. **Mothers with suspected or confirmed COVID-19 should be supported and enabled to remain together with their infants when the mother is well enough, and to practice skin-to-skin/kangaroo care** (World Health Organisation, 2020c) . They should be cared for as an isolated dyad, in a side ward or at home, where the mother can practice effective hygiene measures as outlined in Recommendation 2. Where at all possible the mother should be the main care giver. National guidelines for infection control should be followed where medical assistance is required with use of appropriate PPE and hygiene measures.
11. Infants in neonatal units and in transitional care need contact with and care by their parents. **Unless one of the parents has suspected/confirmed COVID-19 both parents should be able to be present in the neonatal unit at all times, and should be viewed as partners in care, not visitors, and opportunities for**

kangaroo care should be maximised (Royal College of Paediatrics and Child Health, 2020). Neonatal units should pro-actively encourage and involve parents in the care of their baby/babies and identify ways of supporting and enabling this at all times through day and night.

12. Rarely, mothers with suspected/confirmed COVID-19 have a baby who requires care in the neonatal unit (Knight et al 2020). Considering the paucity of evidence to inform shared decisions in this situation, and acknowledging the possibility that infants requiring care in a neonatal unit (typically because of respiratory and other problems related to preterm birth, congenital anomalies, or encephalopathy) have a higher risk of severe disease due to postnatal SARS-Cov-2 infection: **for a mother who has suspected or confirmed COVID-19 and whose baby needs to be cared for on the neonatal unit, a precautionary approach should be adopted to minimise any risk of mother-to-infant transmission; while at the same time, taking steps to involve parents in decisions and to mitigate potential problems for the baby's health and well-being and for breastfeeding and attachment** (Conde-Agudelo and Díaz-Rossello, 2016; Arnaez *et al.*, 2020; Breindahl *et al.*, 2020; Royal College of Paediatrics and Child Health, 2020; Stuebe, 2020; World Health Organisation, 2020b).
- a. Testing should be available for parents with suspected COVID-19 to avoid unnecessary separation.
 - b. Infants will need to be isolated, with staff using personal protective equipment (enhanced for infants needing respiratory support that generates aerosols), at least until the RT-PCR test for SARS-CoV-2 the baby's nasopharyngeal secretions (obtained at about 72 hours) is confirmed to be negative.
 - c. Mothers with suspected/confirmed COVID-19 should be advised not to visit their infant until seven days post symptoms (or confirmed RT-PCR negative for SARS-CoV-2). It is likely that the other parent will need to self-isolate for 14 days because of contact with the baby's mother.
 - d. These decisions should be discussed with the parents whenever possible, and parents should be reassured that they remain partners in on-going decisions about their baby's care.
 - e. The mother should be offered additional support for breastmilk expression (see Recommendation 24), aligned to efforts to maximise attachment with both parents including photographs and webcam links.
 - f. The baby should be reunited with the parents as soon as possible. This could include being cared for together in a side ward in a low dependency setting; where parents and staff should practice respiratory and hand hygiene, complying with current infection control advice.
 - g. When discharged home, the parents should receive information and additional care as needed to promote attachment and breastfeeding.

Infant feeding

13. **Detailed guidelines for staff and services on infant feeding in the current context should be implemented and consistently used to optimise care and to avoid inconsistent and inaccurate information for women.** Appropriate

guidelines developed by the Scottish Government are listed in the Resources section (Scottish Government, 2020).

14. **Regardless of infant feeding method, all women need ongoing close contact with their babies, and information and support with feeding until they are confident and the infant is feeding effectively** (McFadden *et al.*, 2017). This information and support can be provided by health professionals, peer supporters, and by appropriately trained voluntary services, and be by face-to-face or virtual contact. Information is provided in the Resources section.
15. **Appropriate postnatal contacts and referral systems should be in place for all women and infants**, whether face to face or by virtual technology, and whether delivered by midwives, health visitors or the voluntary sector, to meet women's needs for information and support and address their concerns about infant feeding, until effective infant feeding is established (Scottish Government, 2020). PPE should be available for staff and volunteers conducting face to face visits. Where possible, the first visit at home (day 1 following birth or discharge home) should be prioritised as a face-to-face visit and a minimum of three visits in the first 10 days is recommended (Royal College of Midwives and Royal College of Obstetricians and Gynaecologists, 2020).
16. **It is important to seek the views of women and staff** about effective, context-specific ways of enabling women to breastfeed, to maximise the use of breast milk, and to minimise the risks of breastmilk substitutes in this current crisis (Renfrew *et al.*, 2008; McAndrew *et al.*, 2012; The Food Foundation, 2020). Information is provided in the Resources section.

Breastfeeding and feeding with breastmilk

17. **Breastfeeding is strongly recommended for all women and newborn infants** because of its known lifelong importance for women's and children's health and well-being (World Health Organisation, 2020b; World Health Organisation Euro, 2020). Human milk contains numerous live constituents, including immunoglobulins, antiviral factors, cytokines and leucocytes that help to destroy harmful pathogens and boost the infant's immune system (World Health Organisation Euro, 2020).
18. **The unique value of breastfeeding to newborn infants, women, and public health especially in this pandemic should be recognised and highlighted by health professionals, policy makers, and the public.** The active and passive immunity to infections conferred by breastfeeding increase its benefit even further at this time. There are growing indications that breastmilk may be a valuable source of antibodies against SARS-CoV-2 (Fox *et al.*, 2020a).
19. **Information and support, psychological and practical, should be available to all women in pregnancy and from the first feed onwards** to enable them to initiate and continue breastfeeding, including breastmilk expression; whether or not they or their infants and young children have suspected or confirmed COVID-19 (Balogun *et*

al., 2016; McFadden *et al.*, 2017; The Scottish Government, 2017; Unicef UK Baby Friendly Initiative, 2020b; World Health Organisation, 2020b).

20. ***Sensitive conversations about infant feeding should be conducted with all women, and should include information, encouragement and support to consider breastfeeding*** (Scottish Government, 2020; Unicef UK Baby Friendly Initiative, 2020b; World Health Organisation, 2020b; World Health Organisation Euro, 2020).
21. ***Women and babies should be enabled to stay together, to have skin-to-skin contact, and to breastfeed responsively*** to optimise the establishment of breastfeeding (Moore *et al.*, 2016; Unicef UK Baby Friendly Initiative, 2020b).
22. Mother's own milk should always be the first choice as this is responsive to her and her baby's environment. However, ***if mother's own milk is not available or where it needs supplementation, donor human milk is the option of choice, especially for vulnerable infants*** (World Health Organisation, 2019; Shenker, Aprigio, *et al.*, 2020). There remains no evidence to date that vertical transmission occurs through human milk (World Health Organisation, 2020a). Milk banks have adopted measures that mitigate the theoretical risk of transmission through donated milk and containers. These measures include specific questions during donor screening of SARS-CoV-2 infection or exposure, care to ensure social distancing and safety during transportation, and quarantining of milk where possible after collection (Shenker, Hughes, *et al.*, 2020). The heat instability of the virus means that it is destroyed by temperatures within the range of standard pasteurisation techniques (Rodríguez-Camejo *et al.*, 2018; Chambers *et al.*, 2020; Chin *et al.*, 2020; Conzelmann *et al.*, 2020; G.J. Walker *et al.*, 2020).
23. ***Women who have suspected, probable or confirmed COVID-19 should be enabled and supported to breastfeed***, and to practice respiratory and hand hygiene when caring for and feeding their infant (Royal College of Paediatrics and Child Health, 2020; World Health Organisation, 2020c, 2020b).
24. ***When a woman is not well enough to care for her own infant or where direct breastfeeding is not possible, she should be supported to express her breastmilk by hand expression or by pump, and/or be offered access to donor breast milk.***
 - a. ***All feeding equipment and pumps should be appropriately cleaned and sterilised before use.*** Women should have a dedicated breast pump whenever possible. Methods of sterilisation that use heat, as per manufacturers guidelines, should be used to avoid where possible risk of feed contamination from chemical disinfection (Chin *et al.*, 2020; Human Milk Banking Association of North America, 2020b).
25. ***Accessible resources for women will be needed to inform and enable them to breastfeed, especially those from communities where breastfeeding rates are normally low, and where effective interventions will be needed to enable them to start and to continue to breastfeed*** (Renfrew *et al.*, 2008; Balogun *et al.*, 2016;

McFadden *et al.*, 2017; Relton *et al.*, 2018). Appropriate links are listed below in the Resources section.

Formula feeding

26. **Parents who formula feed need information and support to enable them to bottle feed responsively and effectively**, including pacing feeds and limiting the number of people who feed their baby. They should be encouraged to adhere to current guidance on washing and sterilising equipment. Appropriate resources developed by Unicef UK Baby Friendly Initiative are listed in the Resources section (Scottish Government, 2020; Unicef UK Baby Friendly Initiative, 2020b; Unicef UK Baby Friendly Initiative, First Steps Nutrition and National Infant Feeding Network, 2020).
27. **Health professionals should be alert to any local problems with food security** and the supply of infant formula, bottles and teats, and sterilising equipment. Women may need support to find appropriate suppliers, or to re-lactate (Unicef UK Baby Friendly Initiative, 2020b; Unicef UK Baby Friendly Initiative, First Steps Nutrition and National Infant Feeding Network, 2020). Midwives should be aware of the impact of food poverty (Etheridge, 2014; The Food Foundation, 2019, 2020; Pérez-Escamilla, Cunningham and Moran, 2020), which is likely to increase in the wake of the pandemic.
28. Increasing numbers of families rely on universal credit at this time of social and economic turbulence, and existing inequities are likely to be exacerbated by this pandemic. Families in receipt of universal credit are entitled to Healthy Start vouchers or the equivalent in devolved nations. **Supporting families to claim their Healthy Start vouchers will help them to overcome some of the logistical challenges and purchase adequate supplies of formula and to access Healthy Start vitamins** (McFadden *et al.*, 2014, 2015; Ohly *et al.*, 2017; Unicef UK Baby Friendly Initiative, First Steps Nutrition and National Infant Feeding Network, 2020).

Staff

29. **Accessible resources for staff will be needed to enable them to inform and support women and to have appropriately sensitive conversations with women** (<https://www.unicef.org.uk/babyfriendly/guidance-documents/>). Staff shortages and redeployment mean that not all staff caring for women in pregnancy, at birth, and postnatally will be up to date with the knowledge and skills to help women with breastfeeding (Unicef UK Baby Friendly Initiative, 2020b), and they may need easily accessible support so they can rapidly learn to do this effectively and sensitively. Appropriate resources to support staff in this situation, developed by Unicef UK BFI, are listed in the Resources section.
30. **All staff working in maternity and neonatal care need support**. The pandemic and its impact on health services and the care of women and newborn infants is stressful for staff as well as for parents (Hunter, Renfrew and Downe, 2020; Renfrew *et al.*, 2020a). Staff shortages, long shifts, and anxiety about COVID-19 are common

(Royal College of Midwives, 2020a). Staff who have been working to implement improvements in care, including family-centred care, skin-to-skin and kangaroo care, and the Unicef UK BFI standards, and to enable and support women with breastfeeding, may experience additional stress including moral distress, as their work seems to be stopped or even reversed (Arnaez *et al.*, 2020; Greenberg *et al.*, 2020).

31. ***As the current crisis abates strategies will be needed to ensure that previous evidence based services that have been put on hold or amended are not lost, but instead are reinstated and developed further, based on the best possible evidence.*** Interdisciplinary team working and the involvement of women and families in service re-design will be essential to continue the development of quality maternity and neonatal care (Arnaez *et al.*, 2020; Renfrew *et al.*, 2020b).

Resources for staff and parents

Staff:

- Detailed evidence-informed guidelines on infant feeding for maternity services: <https://www.gov.scot/publications/coronavirus-covid-19-guidance-infant-feeding-service/pages/2/>
- Unicef UK Baby Friendly Initiative statements on infant feeding during the COVID-19 outbreak: <https://www.unicef.org.uk/babyfriendly/infant-feeding-during-the-covid-19-outbreak/>
- COVID-19 relevant, evidence-based guidance sheets for staff have been developed by Unicef UK BFI and are available at <https://www.unicef.org.uk/babyfriendly/guidance-documents/>
- Unicef UK Baby Friendly Initiative easy-to-use education refresher sheets for staff working to deliver postnatal care during the coronavirus outbreak <https://www.unicef.org.uk/babyfriendly/education-refresher-sheets/>
- Unicef UK Baby Friendly Initiative guide for local authorities on infant feeding during the coronavirus crisis (including information on formula feeding supplies) <https://www.unicef.org.uk/babyfriendly/wp-content/uploads/sites/2/2020/04/Unicef-UK-Baby-Friendly-Initiative-guide-for-local-authorities-on-infant-feeding-during-the-coronavirus-crisis.pdf>
- Unicef UK Baby Friendly Initiative resources on maximising breastmilk <https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/breastfeeding-resources/maximising-breastmilk/>
- Information on infant formula and bottle feeding from Unicef UK Baby Friendly Initiative : <https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/bottle-feeding-resources/>
- World Health Organisation HO FAQs on breastfeeding and COVID-19 for healthcare workers: https://www.who.int/docs/default-source/maternal-health/faqs-breastfeeding-and-covid-19.pdf?sfvrsn=d839e6c0_1
- Institute of Health Visiting information for health visitors: <https://ihv.org.uk/news-and-views/press-releases/ihv-launches-covid-19-professional-advice-for-health-visiting/>

Parents:

- Appropriate resources for parents:

- <https://www.nhs.uk/start4life/baby/coronavirus-covid19-advice-for-parents/>
- <https://www.nhsinform.scot/illnesses-and-conditions/infections-and-poisoning/coronavirus-covid-19/coronavirus-covid-19-pregnancy-and-newborn-babies>
- <http://www.healthscotland.com/uploads/documents/120-Off%20to%20a%20good%20start-Feb2019-English.pdf>
- <https://ihv.org.uk/news-and-views/news/new-resource-for-parents-supporting-breastfeeding-during-covid-19/>

- The National Breastfeeding Helpline is available 7 days a week, from 9.30am to 9.30pm: <https://www.breastfeedingnetwork.org.uk/coronavirus/>

- Breastfeeding support can be accessed from national voluntary organisations:
 - NCT: <https://www.nct.org.uk/>
 - La Leche League GB: <https://www.laleche.org.uk/>
 - The Breastfeeding Network: www.breastfeedingnetwork.org.uk
 - Drugs and Medicines advice from The Breastfeeding Network: <https://www.breastfeedingnetwork.org.uk/drugs-factsheets/>
 - Association of Breastfeeding Mothers: <https://abm.me.uk/>

- Information on infant formula and bottle feeding is available from First Steps Nutrition Trust: <https://www.firststepsnutrition.org/parents-carers>

- Information on infant formula and bottle feeding from Unicef UK Baby Friendly Initiative : <https://www.unicef.org.uk/babyfriendly/baby-friendly-resources/bottle-feeding-resources/>

Table 1: Relevant studies, reviews, and guidelines

Authors, date, country	Journal	Paper type	Comment
Vertical transmission			
Walker et al 12/06/20 UK, Ireland, Canada, Australia (K. F. Walker <i>et al.</i> , 2020)	British Journal of Obstetrics and Gynaecology Maternal transmission of SARS-COV-2 to the neonate, and possible routes for such transmission: A systematic review and critical analysis	Systematic review	Systematic review of 49 studies. 'Neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother. Very few infections have been reported in the newborns of COVID-19 positive mothers. Two were reported to have occurred despite isolation from the mother and in two it was not possible to tell what approach was taken to isolation. COVID-19 disease should not be an indication of for caesarean birth, formula feeding, or isolation of the infant from the mother'.
Possibility of in utero transmission			
Dong, Mo and Hu 16/03/2020 China (Dong, Mo and Hu, 2020)	Pediatrics Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China	Case series	
Yu et al. 24/03/2020 China (N Yu <i>et al.</i> , 2020)	The Lancet Infectious Diseases Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-centre, descriptive study	Case series	
Zeng et al. 26/03/2020 China (H. Zeng <i>et al.</i> , 2020)	JAMA Network Open Antibodies in Infants Born to Mothers With COVID-19 Pneumonia	Case series	This paper reports on a small cohort of six women with mild coronavirus symptoms; all had caesarean sections and were separated from their babies. Although there were some serological changes none of the infant showed any clinical symptoms.

Zeng et al. 26/03/2020 China (L. Zeng <i>et al.</i> , 2020)	JAMA Pediatrics Neonatal Early-Onset Infection With SARS-CoV-2 in 33 Neonates Born to Mothers With COVID-19 in Wuhan, China	Case series	This study examined outcomes in a cohort of 33 infants with symptoms of COVID-19. All samples, including amniotic fluid, cord blood, and breast milk, were negative for SARS-CoV-2. 'Vertical maternal-fetal transmission cannot be ruled out in the current cohort. Therefore, it is crucial to screen pregnant women and implement strict infection control measures, quarantine of infected mothers, and close monitoring of neonates at risk of COVID-19'.
Dong et al. 26/03/2020 China (Dong <i>et al.</i> , 2020)	JAMA Network Open Possible Vertical Transmission of SARS-CoV-2 From an Infected Mother to Her Newborn	Case report	This paper reports a case study of an infant born by caesarean section to a mother with COVID-19, and immediately separated from the mother. Tests showed some serological changes but the baby developed no symptoms.
Liu, Li et al. 1/4/2020 China (Liu <i>et al.</i> , 2020)	Am J Roentgenology Pregnancy and Perinatal Outcomes of Women With Coronavirus Disease (COVID-19) Pneumonia: A Preliminary Analysis.	Cohort study	
Aghdam et al. 1/4/2020 Iran (Aghdam, Jafari and Eftekhari, 2020)	Infectious Diseases Novel Coronavirus in a 15-day-old Neonate With Clinical Signs of Sepsis, a Case Report	Case report	Case report of a 15 day old term infant of a COVID-19 positive woman from Iran.
Schwartz 16/04/2020 USA (Schwartz DA, 2020)	Archives of Pathology An Analysis of 38 Pregnant Women with 2 COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes.	Case series	This study examined 38 pregnant women with COVID-19 and their newborn infants. There were no maternal deaths and no confirmed cases of intrauterine transmission. All specimens tested were negative. 'At this point in the global pandemic of COVID-19 infection there is no evidence that SARS-CoV-2 undergoes intrauterine or transplacental transmission from infected pregnant women to their fetuses. Analysis of additional cases is necessary to determine if this remains true'.
Yu et al. 22/04/2020 China (Nan Yu <i>et al.</i> , 2020)	The Lancet Infectious Diseases No SARS-CoV-2 detected in amniotic fluid in mid-pregnancy	Original research	

<p>Knight et al. 12/5/2020 UK (Knight <i>et al.</i>, 2020)</p>	<p>Preprint Characteristics and outcomes of pregnant women hospitalised with confirmed SARS-CoV-2 infection in the UK: a national cohort study using the UK Obstetric Surveillance System (UKOSS)</p>	<p>Cohort study</p>	<p>Prospective national population-based cohort study using the UK Obstetric Surveillance System (UKOSS) of 427 pregnancy women admitted to UK hospitals with confirmed COVID-19 infection. 247 gave birth or had a pregnancy loss. Twelve of the 244 liveborn babies tested positive for COVID-19, six in the first 12 hours after birth. None of these babies died; six were admitted to the neonatal unit. There is no information on feeding method. Five babies in the cohort died: three stillborn and two in the neonatal period. Three were reported as definitely unrelated to COVID-19. For two stillbirths it was unclear if COVID-19 contributed to the death.</p>
<p>Rasmussen et al. 24/02/2020 USA (Rasmussen <i>et al.</i>, 2020)</p>	<p>AJOG Coronavirus Disease 2019 (COVID-19) and Pregnancy: What obstetricians need to know</p>	<p>Review</p>	
<p>Lu and Shi 01/03/2020 China (Lu and Shi, 2020)</p>	<p>J Med Virol Coronavirus disease (COVID-19) and neonate: What neonatologist need to know</p>	<p>Review</p>	
<p>Mullins et al. 17/03/2020 UK (Mullins <i>et al.</i>, 2020)</p>	<p>Obs Gynae Coronavirus in pregnancy and delivery: rapid review</p>	<p>Review</p>	
<p>Kimberlin and Stagno 26/03/2020 USA (Kimberlin and Stagno, 2020)</p>	<p>JAMA Network Open Can SARS-CoV-2 Infection Be Acquired In Utero? More Definitive Evidence Is Needed</p>	<p>Review</p>	<p>This editorial examines the evidence presented in Dong et al. 2020 and Zeng et al. 2020. It concludes that there is not virologic evidence for congenital infection to support the serologic suggestion of in utero transmission. 'Is it possible that SARS-CoV-2 can be transmitted in utero? Yes, especially because virus nucleic acid has been detected in blood samples. Is it also possible that these results are erroneous? Absolutely. Although these 2 studies deserve careful evaluation, more definitive evidence is needed before the provocative findings they report can be used to counsel pregnant women that their fetuses are at risk from congenital infection with SARS-CoV-2'.</p>

Dotters-Katz + Hughes 17/04/2020 USA (Dotters-Katz and Hughes, 2020)	Am J Perinatology Considerations for Obstetric Care during the COVID-19 Pandemic	Commentary	
Elwood et al. 31/03/2020 Canada (Elwood <i>et al.</i> , 2020)	J Obstet Gynaecol Can SOGC Committee Opinion – COVID-19 in Pregnancy	Guideline	
Luo and Yin 1/5/2020 China (Luo and Yin, 2020)	The Lancet Infectious Diseases Management of pregnant women infected with COVID-19	Guideline	
Pietrasanta et al. 24/05/2020 Italy (Pietrasanta <i>et al.</i> , 2020)	J Neonatal- Perinatal Management Management of the Mother-Infant Dyad With Suspected or Confirmed SARS-CoV-2 Infection in a Highly Epidemic Context.	Guideline	Description of the COVID-19 driven reorganisation of maternal and perinatal services (across 59 centres in Lombardy, Italy).
RCM / RCOG 04/06/2020 UK (Royal College of Midwives and Royal College of Obstetricians and Gynaecologists, 2020)	RCOG website Coronavirus (COVID-19) infection in pregnancy	Guideline	Transmission: Pregnant women are no more vulnerable than the general public, but some women may have a more severe immune response with more severe symptoms. There may be a cohort of asymptomatic individuals, with minor symptoms, incidence is unknown. Vertical transmission is possible but no evidence for this yet. No evidence that the virus is teratogenic. The newborn may become infected after birth. The benefits of breastfeeding far outweigh potential risks of virus in breast milk. Breastfeeding should be promoted and supported. An increase in levels of anxiety is to be expected. Acknowledge anxieties and build awareness and signing into routes of support including remote access.
Possibility of transmission via breastfeeding			

Chen et al. 7/3/2020 China (Chen <i>et al.</i> , 2020)	The Lancet Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records.	Case series	
Lang and Zhou 8/5/2020 China (Zhejiang Univ-Sci Biomed, Lang and Zhao, 2020)	J Zhejiang Univ Sci B Can SARS-CoV-2-infected women breastfeed after viral clearance?	Case report	Case report of a 35 weeks' gestation infant of a woman with COVID-19 woman in China. Key message was that infant was fed with expressed maternal breast milk (pending negative viral tests in mother), followed by breastfeeding without mother-infant transmission of SARS-CoV-2.
Zimmerman and Curtis 19/05/2020 Switzerland,Australia (Zimmermann and Curtis, 2020)	Pediatric Infectious Disease Journal COVID-19 in Children, Pregnancy and Neonates: A Review of Epidemiologic and Clinical Features	Case series	Four neonates (three with pneumonia) have been reported to be SARS-CoV-2 positive despite strict infection control and prevention procedures during delivery and separation of mother and neonates; vertical transmission could not be excluded.
Perrone et al. 21/05/2020 Italy (Perrone <i>et al.</i> , 2020)	J Med Virology Lack of viral transmission to preterm newborn from a COVID-19 positive breastfeeding mother at 11 days postpartum	Case study	One COVID-positive woman from Italy. No horizontal transmission occurred. RT-PCR assay for SARS-CoV-2 in breast milk was negative.
Aghdam et al. 1/6/2020 Iran (Aghdam, Jafari and Eftekhari, 2020)	Infectious Diseases Novel Coronavirus in a 15-day-old Neonate With Clinical Signs of Sepsis, a Case Report	Case report	
Knight et al. 8/6/2020 UK (Knight <i>et al.</i> , 2020)	BMJ Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: national population-based cohort	Cohort study	Most pregnant women admitted to hospital with SARS-CoV-2 infection were in the late second or third trimester, supporting guidance for continued social distancing measures in later pregnancy. Most had good outcomes, and transmission of SARS-CoV-2 to infants was uncommon. The high proportion of women from black or minority

	study		ethnic groups admitted with infection needs urgent investigation and explanation.
World Health Organisation 23/06/2020 (World Health Organisation, 2020a)	Breastfeeding and COVID-19: Scientific Brief	Systematic review and scientific brief	Based on findings from a living systematic review (latest search 15 th May 2020) with recommendations 'WHO recommends that mothers with suspected or confirmed COVID-19 should be encouraged to initiate or continue to breastfeed. Mothers should be counselled that the benefits of breastfeeding substantially outweigh the potential risks for transmission'.
Dall'Oglio et al. 07/02/2020 Italy (Dall'Oglio <i>et al.</i> , 2020)	J Hum Lact Breastfeeding Protection, Promotion, and Support in Humanitarian Emergencies: A Systematic Review of Literature	Systematic review	There is a dearth of studies evaluating the influence of interventions aimed at improving breastfeeding in emergency settings. More evidence is urgently needed to encourage and implement optimal breastfeeding practices.
Smith et al. 4/5/2020 Australia (Smith <i>et al.</i> , 2020)	PLoS One Maternal and neonatal outcomes associated with COVID-19 infection: A systematic review	Systematic review	Systematic review of maternal COVID infection, recording neonatal outcomes. Higher chance of preterm birth, but only one case of possible vertical transmission (unclear route). "Of 73 identified articles, nine were eligible for inclusion (n=92). 67.4% (62/92) of women were symptomatic at presentation. RT-PCR was inferior to CT-based diagnosis in 31.7% (26/79) of cases. Maternal mortality rate was 0% and only one patient required intensive care and ventilation. 63.8% (30/47) had preterm births, 61.1% (11/18) fetal distress and 80% (40/50) a Caesarean section. 76.92% (11/13) of neonates required NICU admission and 42.8% (40/50) had a low birth weight. There was one indeterminate case of potential vertical transmission. Mean time-to-delivery was 4.3±3.08 days (n = 12) with no difference in outcomes (p>0.05)."
Yang et al. 03/03/2020 Wuhan, China (Yang <i>et al.</i> , 2020)	Journal of Infection Corona Virus Disease 2019, a growing threat to children?	Comment	No evidence of mother-to-child vertical transmission was found. Early isolation and separation practised - no rationale for separation given, except as a precaution.
Stumpfe et al. 26/03/2020 Germany	Geburtshilfe und Frauenheilkunde SARS-CoV-2 Infection in Pregnancy – a Review of the Current Literature and Possible Impact on	Review	Narrative review of literature of cases of infection in pregnancy during the SARS-CoV-1 epidemic of 2002/3, the MERS epidemic since 2012, and the SARS-CoV-2.

(Stumpfe <i>et al.</i> , 2020)	Maternal and Neonatal Outcome		
Breindahl <i>et al.</i> 1/4/2020 Denmark (Breindahl <i>et al.</i> , 2020)	Danish Medical Journal Dilemmas and Priorities in the Neonatal Intensive Care Unit Neonatal Intensive Care Unit during the COVID-19 Pandemic.	Editorial	Editorial discussing best practice in caring for families with suspected or confirmed COVID-19 in the NICU by Danish neonatologists on guiding principles of care.
Mimouni <i>et al.</i> 10/04/2020 Israel (Mimouni <i>et al.</i> , 2020)	Nature Perinatal aspects on the COVID-19 pandemic: a practical resource for perinatal–neonatal specialists	Perspective	
Unicef 21/04/2020 Unicef website	Journal of Pediatrics In support of WHO statement on infant feeding in a pandemic	Commentary	Commentary on European Pediatric Association/Union Of National European Pediatric Societies and Associations (EPA/UNEPSA). www.epa-une psa.org . Endorses EPA/UNEPSA view that breastfeeding remains optimal newborn nutrition, and that it is essential to provide advice and support to enable breastfeeding when the mother has confirmed or suspected COVID-19 infection. If that is not possible other alternatives can be considered, such as the use of certified donor milk bank services, designed to protect the incoming milk supply by rigorous screening criteria for milk donors.
Gianubbilo <i>et al.</i> 29/04/2020 Italy (Raffaele Giannubilo <i>et al.</i> , 2020)	EJOG Obstetric network reorganization during the COVID-19 pandemic: Suggestions from an Italian regional model	Commentary	Description of reorganisation of services in Italian regional network during pandemic, including measures to support breastfeeding by mothers with suspected or confirmed SARS-CoV-2 infection (encourage and support mother infant co-location, with advice on hand hygiene and the use of surgical mask during feeding).
De Rose <i>et al.</i> 29/04/2020 Italy (De Rose, Piersigilli, <i>et al.</i> , 2020)	Italian J Ped Novel Coronavirus disease (COVID-19) in newborns and infants: what we know so far	Review	Concluded (based on data as of April 2020) that there is no evidence of vertical and intrauterine SARS-CoV-2 transmission from women with COVID-19 pneumonia in late pregnancy. 'Uncertainty remains about whether transmission via breast milk occurs'.

Arnaez et al. 30/04/2020 Spain (Arnaez <i>et al.</i> , 2020)	Frontiers in Pediatrics The Impact of the Current SARS-CoV-2 Pandemic on Neonatal Care	Commentary	Experience of neonatal unit care in Spain with analysis of what is needed. Considers the importance of evidence and of family centred care, and of the adverse impact on staff when such care cannot be provided. 'Clear and sensitive leadership, interdisciplinary collaboration and mutual support to achieve common goals are essential....Beyond all these threats, in the current coronavirus pandemic outbreak there are opportunities to develop strategies to maintain the excellence of perinatal care'.
Stanojević 13/05/2020 Croatia (Stanojević, 2020)	J Perinatal Med Are COVID-19-positive Mothers Dangerous for Their Term and Well Newborn Babies? Is There an Answer?	Review	Review of guidance produced during COVID-19 worldwide. Notes value of microbiome. Highlights variety and disparity in practices which have emerged. In those regions of the world where BFHI of the WHO and UNICEF are practiced and more children are born in baby-friendly hospital facilities like in Europe and Eastern Mediterranean, guidance is more oriented toward advocating skin-to-skin contact and preservation of direct breastfeeding in COVID-19-suspected or-positive asymptomatic mothers, than in regions where the percentage of newborns born in BFHI facilities like in Americas and Eastern Asia are much lower. Any intervention be evidenced based, beneficial and do no harm.
Boscia 19/05/2020 USA (Boscia, 2020)	Pediatrics Skin-to-Skin Care and COVID-19.	Perspectives	Examines the issues surrounding skin-to-skin care immediately after birth during the COVID-19 pandemic.
Pietrasanta et al. 20/05/2020 Italy (Pietrasanta <i>et al.</i> , 2020)	Journal of Neonatal-Perinatal Medicine Management of the Mother-Infant Dyad With Suspected or Confirmed SARS-CoV-2 Infection in a Highly Epidemic Context.	Commentary	
Tomori et al. 26/05/2020 USA and Australia (Tomori <i>et al.</i> , 2020)	Mat and Child Nutrition When separation is not the answer: Breastfeeding Mothers and Infants affected by COVID-19	Review	Narrative review and discussion of WHO guidance on the care of infants of mothers with suspected or confirmed COVID-19, with an emphasis on the potential negative impacts of mother-infant separation.
Amatya et al. 21/03/2020	Nature	Guideline	Hospital guideline and triage algorithm based on anecdotal reports and experience from a range of hospitals in the US.

USA (Amatya <i>et al.</i> , 2020)	Management of newborns exposed to mothers with confirmed or suspected COVID-19		
Mother-baby contact and parental presence in the neonatal unit			
Yang 03/03/2020 China (Yang <i>et al.</i> , 2020)	J Infection Corona Virus Disease 2019, a growing threat to children?	Commentary	Perinatal and paediatric implications of COVID-19 experience in Wuhan.
Breindahl <i>et al.</i> 21/04/2020 Denmark (Breindahl <i>et al.</i> , 2020)	Dan Med J Dilemmas and Priorities in the Neonatal Intensive Care Unit Neonatal Intensive Care Unit during the COVID-19 Pandemic.	Editorial	Editorial discussing best practice in caring for families with suspected or confirmed COVID-19 in the NICU by Danish neonatologists on guiding principles of care.
Ma, Zhu and Du 29/04/2020 Italy (Ma, Zhu and Du, 2020)	Italian J Ped Neonatal Management during Coronavirus (COVID-19) Outbreak: Chinese Experiences	Commentary	
Arnaez <i>et al.</i> 30/04/2020 Spain (Arnaez <i>et al.</i> , 2020)	Frontiers in Pediatrics The Impact of the Current SARS-CoV-2 Pandemic on Neonatal Care	Opinion	
Stuebe 08/05/2020 USA (Stuebe, 2020)	Breastfeeding Medicine Should infants be separated from mothers with COVID-19? First do no harm.	Review	Separating mothers and babies is an intervention with serious consequences. It may not prevent infection or may simply delay infection of the neonate. Mothers will be in hospital for a short time only and once home, they are not likely to be able to isolate their own baby from self and/or other family members living in that household. Thus, separation in hospital provides a transient and artificial situation with potentially far more serious consequences for the health of mother and baby. Skin-to-skin contact is important for colonization of the infant microbiome. Separating mother and baby immediately after birth may make the infant more vulnerable to severe respiratory

			infections, including COVID-19, in the first year of life. Keeping the mother and baby together minimises the burden on the health care system. Isolating the mother and infant adds considerable burden onto the health care system. Separation of mother and baby doubles the required resources.
Rasmussen 5/6/2020 USA (Rasmussen and Jamieson, 2020)	JAMA Network Caring for Women Who Are Planning a Pregnancy, Pregnant, or Postpartum During the COVID-19 Pandemic	Opinion	
RCPCH 03/06/2020 UK (Royal College of Paediatrics and Child Health, 2020)	RCPCH website COVID-19 - guidance for neonatal settings	Guideline	<ul style="list-style-type: none"> · Infants of -ve SARS-Cov-2 admitted to NNU do not need to be isolated. · If mother or infant has any respiratory pathology both should be tested · Parents should be treated as part of therapeutic team · Neonatal units should involve parents and identify how to support this at all times of the day 24/7 · Skin to skin and breastfeeding supported and enabled · Both parents to be able to be present, should not be viewed as visitors · Testing should be available to enable parents to stay with their baby · Mothers should be supported to have skin to skin in the nursery unless suspected or confirmed +ve · +ve parents should not be present on the NNU until 7 days after the onset of the illness · EBM hand hygiene, safe transport and storage as per EMBA position statement · Mothers should have designated breast pump
Simon et al. Infect Dis 5/6/2020 Germany (Simon <i>et al.</i> , 2020)	Klinische Pädiatrie Management of Care for Neonates Born to SARS-CoV-2 Positive Women With or Without Clinical Symptoms (COVID-19)	Guideline	Hygiene measures to prevent infection while breastfeeding.
Breastfeeding			

Fox et al. 1/4/2020 USA (Fox <i>et al.</i> , 2020b)	Preprint Evidence of a significant secretory-IgA-dominant SARS-CoV-2 immune response in human milk following recovery from COVID-19	Original research	Preliminary findings from 1600 women. No IgM was found specific to SARS-CoV-2.
Lang and Zhao 1/5/2020 China (Zhejiang Univ-Sci Biomed, Lang and Zhao, 2020)	Journal of Zhejiang University, Science B Can SARS-CoV-2-infected women breastfeed after viral clearance?	Case report	Report of the clinical course of a pregnant woman with COVID-19.
Grosse et al. 22/05/20 Germany (Groß <i>et al.</i> , 2020)	Lancet Detection of SARS-CoV-2 in human breastmilk	Case reports	Report of two mothers infected antenatally with COVID-19.
Bullard et al. 22/05/20 Canada (Bullard <i>et al.</i> , 2020)	Clinical Infectious Diseases Predicting infectious SARS-CoV-2 from diagnostic samples	Original research	Performed cell culture on 90 nasopharyngeal or endotracheal clinical samples. Found no infectivity with Ct values >24 and samples more than 8 days after symptom onset. Lower Ct values confer greater infectivity. All milk samples recorded as 'positive' to date have had Ct values over 30, showing it took more rounds of PCR amplification to record a positive result. This paper suggests that would be too few viral particles to infect infants during feeding. It might also represent fragments of virus that are antigenic in the infant to generate an immune response, which would potentially be protective.
Costa et al. 26/05/20 Italy (Costa <i>et al.</i> , 2020)	Clinical Microbiology and Infection Excretion of SARS-CoV-2 in human breast milk	Case reports	Two case reports of mothers diagnosed antenatally with COVID-19.
Tam et al. 30/05/20 Australia (Tam <i>et al.</i> , 2020)	Clinical Infectious Diseases Detectable severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in human breast milk of a mildly symptomatic patient with coronavirus	Case report	Case report of breastfeeding woman with COVID-19 infection with detectable viral RNA in human milk. The infant was already infected at presentation with acquisition likely through overseas travel as well as close contact with the mother through respiratory transmission. Transmission of virus via breastfeeding is uncertain but presumed

	disease 2019 (COVID-19)		unlikely.
Luo et al. 1/6/2020 China (Luo <i>et al.</i> , 2020)	Preprint Safety of Breastfeeding in Mothers with SARS-CoV-2 Infection	Original research	Milk samples from 23 COVID-19 mothers assessed. None were positive for SARS-CoV-2. IgM antibodies specific to SARS-CoV-2 were shown, correlating with blood. IgG antibodies not shown. No infants became ill, none tested positive, no vertical transmission suggested.
Lackey et al. 30/05/20 USA (Lackey <i>et al.</i> , 2020)	MCN SARS-CoV-2 and human milk: What is the evidence?	Review	Limited published literature related to vertical transmission of any human coronaviruses via human milk and/or breastfeeding. None of the studies on coronaviruses and human milk report validation of their collection and analytical methods for use in human milk. Future research should utilize validated methods and focus on both potential risks and protective effects of breastfeeding.
Panthi et al. 1/6/2020 Nepal (Panthi <i>et al.</i> , 2020)	Int J Equity in Health An urgent call to address the nutritional status of women and children in Nepal during COVID-19 crises	Opinion	Opinion piece from Nepal, highlighting how a reduction in confidence around breastfeeding will have major impacts on the health of infants in Nepal.
Forestieri 4/6/2020 Italy (Forestieri <i>et al.</i> , no date)	The Journal of Maternal-Fetal & Neonatal Medicine Relationship between pregnancy and coronavirus: what we know	Review	Review article, restating that vaginal birth and breastfeeding are considered safe. The clinical condition of individual dyads should be considered.
Scottish Government 31/03/2020 Scotland (Scottish Government, 2020)	Scottish Government website Coronavirus (COVID-19) guidance for Infant Feeding Service.	Guideline	Detailed guidance for infant feeding services during the COVID-19 pandemic
Davanzo et al. 3/4/2020 Italy (Davanzo <i>et al.</i> , 2020)	Maternal & Child Nutrition Breastfeeding and Coronavirus Disease-2019. Ad interim indications of the Italian Society of Neonatology endorsed by the Union of European Neonatal & Perinatal Societies.	Guideline	If a mother previously identified as COVID-19 positive or under investigation for COVID-19 is asymptomatic or paucisymptomatic at delivery, rooming-in is feasible and direct breastfeeding is advisable, under strict measures of infection control when a mother with COVID-19 is too sick to care for the newborn, the neonate will be managed separately and fed fresh expressed breast milk, with no need to pasteurize it, as human milk is not believed to be a vehicle of

			COVID-19'.
WHO Euro 08/04/2020 Global (World Health Organisation Euro, 2020)	WHO website COVID-19 and breastfeeding: position paper	Guideline	There is currently no evidence that COVID-19 can be passed to the baby through breastfeeding. To facilitate breastfeeding, mothers and babies should be enabled to stay together as much as possible, to have skin-to-skin contact, to feed their baby responsively and to have access to ongoing support when this is needed. There is indisputable evidence that breastfeeding reduces the risk of babies developing infectious diseases. Human milk contains numerous live constituents, including immunoglobulins, antiviral factors, cytokines and leucocytes that help to destroy harmful pathogens and boost the infant's immune system. Considering the protection that human milk and breastfeeding offers the baby and the minimal role it plays in the transmission of other respiratory viruses, we should do all we can to continue to protect, promote and support breastfeeding.
WHO 28/4/2020 WHO (World Health Organisation, 2020b)	WHO website Frequently asked questions: Breastfeeding and COVID-19 for health care workers.	Guideline	This FAQ complements the WHO interim guidance. The numerous benefits of skin to skin and breastfeeding/use of human milk substantially outweigh the potential risks of transmission and illness associated with COVID-19. Infant formula should only be when the mothers own milk or donor human milk is not available.
Unicef UK BFI 14/05/2020 UK (Unicef UK Baby Friendly Initiative, 2020b)	Unicef website Statement on infant feeding during the coronavirus (COVID-19) outbreak	Guideline	
WHO 27/05/2020 Global (World Health Organisation, 2020c)	WHO website Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected [Section 19: Feeding and caring for infants and young children of mothers with COVID-19]	Guideline	SARS-CoV-2 unlikely to be transmitted to infants through breastfeeding or via expressed breast milk from a mother with confirmed/suspected COVID-19. There is no reason to avoid or stop breastfeeding or skin-to-skin contact (with hygiene measures and use of maternal face-mask where available). Maternal expressed breast milk is the alternative when direct breast feeding is not feasible, donor breast milk is the alternative when maternal breast milk is not available.

CDC 09/06/2020 USA (Centres for Disease Control, 2020)	CDC website Pregnancy, breastfeeding, and caring for young children: coronavirus disease 2019	Guideline	
Milk banking			
Rodriguez-Camejo et al. 7/10/2018 Uruguay (Rodríguez-Camejo et al., 2018)	J Hum Lact Antibody Profile of Colostrum and the Effect of Processing in Human Milk Banks: Implications in Immunoregulatory Properties	Original research	Study demonstrating preservation of antibodies in human milk post-pasteurisation. Some subclasses of antibody are unaffected, including IgG. Others have reduced volume of ~30% capacity.
Marinelli 30/03/2020 USA (Marinelli, 2020)	J Hum Lact International Perspectives Concerning Donor Milk Banking During the SARS-CoV-2 (COVID-19) Pandemic	Opinion	Overview of challenges for milk banking in this pandemic based on personal reports from milk banks in three countries. Demonstrated lack of consistency globally, also the risk of donations dropping for logistical reasons. Prompted a strong response from milk banks globally (HMBANA 2020).
HMBANA 8/4/2020 USA (Human Milk Banking Association of North America, 2020a)	HMBANA blog Formal response from HMBANA to the Marinelli and Lawrence article	Opinion	Response to Marinelli and Lawrence 2020 re their recommendation that all mothers, hospitals, daycare settings, and milk banks around the world apply a toxic and illegal concentration of sodium hypochlorite to infant food packaging (milk storage containers). HMBANA urges JHL and the authors to retract this statement, given violations of food manufacturing safety laws that could put vulnerable infants at additional risk; and lack of evidence of transmission through human milk and the long-term public health damage that may be done by positioning human milk as “risky.”
De Rose 23/04/2020 Italy (De Rose, Reposi, et al., 2020)	J Hum Lact Use of Disinfectant Wipes to Sanitize Milk’s Containers of Human Milk Bank During COVID-19 Pandemic	Opinion	Response to Marinelli 2020 illustrating the need for communication with donors, optional forms of container decontamination and continued functioning of human milk banks.
Furlow B 1/5/2020	Lancet Child and Adolescent Health	Commentary	Reports on preparations being made by neonatal intensive care units (NICUs) and donor human milk programmes across the United States

USA (Furlow, 2020)	US NICUs and donor milk banks brace for COVID-19		to continue to provide services during the coronavirus disease 2019 (COVID-19) pandemic.
Shenker et al. 6/5/2020 Global (Shenker, Aprigio, et al., 2020)	Lancet Child and Adolescent Health Maintaining safety and service provision in human milk banking: a call to action in response to the COVID-19 pandemic	Comment	United response from milk bank leaders and associations, representing 36 countries. Estimated that over 800,000 infants yearly receive screened donor milk. Has initiated the Global Alliance of Milk Banks and Associations, which is currently conducting a Delphi to achieve a consensus to milk bank responses to this and future pandemics.
Shenker et al. 15/05/20 UK (Shenker, Hughes, et al., 2020)	Infant Response of UK milk banks to ensure the safety and supply of donor human milk in the COVID-19 pandemic and beyond.	Commentary	The COVID-19 pandemic is presenting several challenges to human milk banks and has highlighted a number of vulnerabilities in service provision that have been long known by those who work in the sector. In recent weeks, milk banks across the UK have worked together to understand any risks posed to infants, milk bank staff and volunteers by COVID-19, and to put in place mitigation strategies to ensure the safeguarded provision and safety of donor human milk. Includes a provisional set of guidelines for the management of a human milk bank in response to COVID-19.
Jayagobi and Chien 1/6/2020 Singapore (Jayagobi and Mei Chien, 2020)	J Hum Lact Maintaining a Viable Donor Milk Supply During the SARS-CoV-2 (COVID-19) Pandemic	Opinion	Response to Marinelli and Lawrence 2020 highlighting how improved communication and screening steps can maintain donor human milk supplies.
Sachdeva et al. 09/06/2020 India (Sachdeva et al., 2020)	Indian Pediatrics Ensuring Exclusive Human Milk Diet for All Babies in COVID-19 Times	Commentary	Comprehensive discussion paper on the challenges faced by services that deliver care and services for neonates in India, and policies that have been developed with relation to NICU care, expression and provision of donor milk, and kangaroo care.
Marinelli and Lawrence 3/4/2020 USA (Marinelli and	J Hum Lact Safe Handling of Containers of Expressed Human Milk in all Settings During the SARS-CoV-2 (COVID-19) Pandemic.	Guidance	This paper has been challenged by authors from several countries: it's recommendation on disinfection is contrary to FDA legal limits (see HMBANA 2020).

Lawrence, 2020)			
Preterm birth rate			
Philip et al. 5/6/2020 Ireland (Philip <i>et al.</i> , 2020)	Preprint Reduction in preterm births during the COVID-19 lockdown in Ireland: a natural experiment allowing analysis of data from the prior two decades.	Observational	This observational study reports an unprecedented drop in preterm birth rates from 8-9% to 2.1% (73% overall drop) for the same time periods during the COVID-19 pandemic. Anecdotally, this reflects the experience from the US, Canada, China, France and Norway, and some units in the UK. The causes for the reduction in preterm births are unclear, but may reflect the socioeconomic impacts of the lockdown.
Others			
McDonald 1/6/2020 UK (McDonald, 2020)	Lancet COVID-19 and essential pregnant worker policies	Comment	Comment reinforces the hypercoaguable state induced by COVID-19 in some patients poses a particular risk to pregnant healthcare workers.
Perez-Escamilla et al 9/6/2020 US, Nepal, UK (Pérez-Escamilla, Cunningham and Moran, 2020)	Maternal and Child Nutrition COVID-19, food and nutrition insecurity and the wellbeing of children, pregnant and lactating women: A complex syndemic	Comment	This pandemic has shown the weaknesses of the current food, nutrition, and social protection systems, and future pandemics and epidemics are likely. Future research should include implementation research to improve: food assistance programs for young children, pregnant and lactating women; equitable effective rapid response systems to prevent or mitigate food insecurity, especially for children, pregnant, and lactating women; and monitoring and use of surveillance systems to effectively identify and target provision of healthy and nutritious foods to families that are the most socio-economically vulnerable, such as young children and pregnant and lactating women.

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Keywords used in MIDIRS searches

An asterisk * has been used to denote truncation in searches

Mother-baby contact and separation

Keywords

Epidemic*, pandemic*, “disease outbreak*”, coronavirus, COVID-19, covid-19, “severe acute respiratory syndrome”, SARS, “Middle East respiratory syndrome”, MERS, H1N1, influenza, flu pneumonia, contact, separation, “kangaroo care”, “skin to skin”, skin-to-skin, post-birth, postbirth, “post birth”, post-natal, postnatal, “post natal”, post-partum, postpartum, “post partum”.

Example search strings:

(pandemic* OR epidemic* OR “disease outbreak*”) AND (contact OR separation) AND (post-birth OR postbirth OR “post birth” OR post-natal OR postnatal OR “post natal” OR post-partum OR postpartum OR “post partum”).)

(coronavirus OR COVID-19 OR covid-19) AND (contact OR separation) AND (post-birth OR postbirth OR “post birth” OR post-natal OR postnatal OR “post natal” OR post-partum OR postpartum OR “post partum”)

Infant feeding and pandemics

Keywords

Breastfeed*, breast-feed*, “breast feed*”, “bottle feed*”, bottle-feed*, “infant feed*”, infant-feed*, “infant formula”, epidemic*, pandemic*, “disease outbreak*”, coronavirus, COVID-19, covid-19, “severe acute respiratory syndrome”, SARS, “Middle East respiratory syndrome”, MERS, H1N1, influenza, pneumonia

Example search strings:

(pandemic* OR epidemic* OR “disease outbreak*”) AND (breastfeed* OR breast-feed* OR “breast feed*” OR “bottle feed*” OR bottle-feed* OR “infant feed*” OR “infant-feed*”) (coronavirus OR COVID-19 OR covid-19) AND (breastfeed* OR “breast feed*” OR “breast-feed*” OR “bottle feed*” OR bottle-feed* OR “infant feed*” OR “infant-feed*”)

Infant feeding in emergency situations

Breastfeed*, breast-feed*, “breast feed*”, “bottle feed*”, bottle-feed*, “infant feed*”, infant-feed*, “infant formula”, “donor milk”, “donor breast milk” emergenc*, war* disaster*, earthquake*, hurricane* tsunami*, refugee*, asylum seeker*, “misplaced person*” immigrant*, famine)

Example search strings

(breastfeed* OR “breast feed*” OR breast-feed* OR “bottle feed*” OR “infant feeding” OR “infant formula”) AND (emergenc* OR war* OR disaster* OR earthquake* OR hurricane* OR tsunami* OR famine) (“donor milk” OR “donor breast milk”) AND (emergenc* OR war* OR disaster* OR earthquake* OR hurricane* OR tsunami* OR famine)

Search pack PN3 – Breastfeeding the baby in intensive care

PN3 – Breastfeeding the baby in intensive care, is one of over 600 search packs compiled and regularly updated by MIDIRS Librarians when selecting items for the Maternity and Infant Care (MIC) database. Each search pack comprises collections of records on a particular topic, selected from a wide range of information resources that include more than 400 journals and other research materials.