



Contents available at [ScienceDirect](#)

Diabetes Research
and Clinical Practice

journal homepage: www.elsevier.com/locate/diabres



International
Diabetes
Federation



Breastfeeding during the COVID-19 pandemic: Suggestions on behalf of woman study group of AMD



Chiara Giuliani^{a,*}, Patrizia Li Volsi^b, Elisabetta Brun^c, Anna Chiambretti^d,
Annalisa Giandalia^e, Laura Tonutti^f, Paolo Di Bartolo^g, Angela Napoli^h

^a Experimental Medicine Department, Sant'Andrea Hospital, "Sapienza" University of Rome, Italy

^b S.S.D. di Endocrinologia e Malattie del Ricambio, "ASFO" Pordenone, Italy

^c Diabetology and Metabolic Diseases Unit, ULSS 8 Vicenza, Italy

^d Metabolism and Diabetes Unit, ASL TO4 Chivasso, TO, Italy

^e Department of Clinical and Experimental Medicine, University of Messina, Italy

^f Endocrinology, Diabetes, Metabolism and Clinical Nutrition, Azienda Sanitaria Universitaria Integrata di Udine, Udine, Italy

^g Rete Clinica di Diabetologia Aziendale, Dipartimento Internistico di Ravenna, A.Usl della Romagna, Italy

^h Clinical and Molecular Medicine Department, Sant'Andrea Hospital, "Sapienza" University of Rome, Italy

ARTICLE INFO

Article history:

Received 26 April 2020

Received in revised form

18 May 2020

Accepted 21 May 2020

Available online 30 May 2020

Keywords:

Covid-19

Breastfeeding

Pregnancy

Diabetes

ABSTRACT

SARS-Cov2 infection has recently spread to Italy with important consequences on pregnancy management, mother and child health and mother–child contact. Breastfeeding improves the health of mother and child and reduces risk of neonatal infection with other pathogens that are likely to cause serious illness.

To date no evidence confirmed COVID-19 vertical transmission from infected pregnant mother to their fetus. However it is well known that an infected mother can transmit the COVID-19 virus through respiratory droplets during breastfeeding or intimate contact.

Thus, the mothers with known or suspected COVID-19 should adhere to standard and contact precautions during breastfeeding.

Woman Study Group of AMD, after reviewing current knowledge about COVID-19 vertical transmission and the compatibility of breastfeeding in COVID-19 mother, the available recommendations from Health Care Organizations and main experts opinions, issued the following suggestions on breastfeeding during the COVID-19 pandemic, addressed both to mothers with and without diabetes.

It should be considered that following suggestions may change in the future when more evidence is acquired regarding SARS-Cov2 infection.

© 2020 Elsevier B.V. All rights reserved.

* Corresponding author at: Experimental Medicine Department, Ospedale Sant'Andrea, Sapienza University of Rome, via di Grottarossa 1035, 00189 Rome, Italy.

E-mail addresses: chiara.giul@gmail.com, chi.giuliani@uniroma1.it (C. Giuliani).

<https://doi.org/10.1016/j.diabres.2020.108239>

0168-8227/© 2020 Elsevier B.V. All rights reserved.

1. Current knowledge

Breastfeeding improves the health of mother and child with benefits for families and positive social and economic impact [1].

Currently there is no robust evidence for intrauterine vertical transmission of COVID-19 from infected pregnant mothers to their fetuses [2].

A Chinese case report [3] described the first case of neonatal COVID-19 infection in China whose mother was confirmed with COVID-19. However, whether the case is a vertical transmission from mother to child cannot be confirmed due to the late execution of the neonatal oropharyngeal swab, performed 36 h after birth. A retrospective analysis of 9 cases of women with COVID-19 pneumonia confirmed diagnosis subjected to cesarean section in China found no vertical transmission of infection from mother to infant. Virus research on amniotic fluid, umbilical cord blood and nasopharyngeal swab of newborns has always been negative [4].

Chen Y et al. [5] reported four cases of live born infants, born to pregnant women with the COVID-19 infection in Wuhan: newborns had no clinical signs of disease and were tested negative for the virus at delivery.

Two articles from two Chinese research teams present details of 3 neonates who may have been infected with severe acute respiratory syndrome SARS-CoV2 in utero from mothers with 'COVID-19' [6,7].

Evidence for such transmission was based on high IgM antibody levels in neonatal blood after birth. All infants also had high IgG antibody values and high cytokine levels, though IgG antibody may have crossed the placenta from the mother to the fetus. None of the three neonates had a positive reverse transcriptase-polymerase chain reaction test result supporting utero transmission [8].

However, the suggestion of in utero transmission rests on IgM detection in the three neonates; IgM antibodies are too large to cross the placenta, therefore their detection in a newborn could be assumed to reflect fetal production following in utero infection even though IgM assays can be prone to false positive and false negative-results. On the other hand, although a study on three Covid-19 mothers suggests that there are no morphological changes related to infection in the three placentas, it is not well known whether a hypothetical alteration of placental architecture could favor macromolecules passage from infected mother to infant [9].

Despite the kinetics of IgM production and decay in SARS-CoV-2 infections are not yet known, the rapid IgM decline reported in this patients was very rapid raising the possibility that the laboratory findings are not evidence of true congenital infection, rather could represent artifact.

Finally, the variability in sensitivity and specificity of IgM assay among laboratories, suggests caution in interpreting these results.

In conclusion, despite SARS-CoV-2 in utero transmission could be possible as virus nucleic acid has been detected in blood sample [10] and other vertical virus transmission from mother to infant is well documented, more definitive evidence is needed before the provocative available findings

can be used to counsel pregnant women that their fetuses are at risk from congenital infection with SARS-Cov-2 [8].

On the other hand, it is well known that, after birth, an infected mother can transmit the COVID-19 virus through respiratory droplets during breastfeeding or intimate contact [8,11]. [HYPERLINK "SPS:refid::bib8_bib11"](#).

Based on the available limited literature, neonatal COVID-19 appears to have a horizontal transmission and to be paucisymptomatic or asymptomatic compared to older age groups.

Thus, the mothers with known or suspected COVID-19 should adhere to standard and contact precautions during breastfeeding and comply with the recommended hygiene measures to avoid the risk of transmission through breath droplets [12].

At the New York-Presbyterian Allen Hospital and Columbia University Irving Medical Center 215 obstetrical patients, presenting for delivery between March 22 and April 4, 2020, were screened for Covid-19 symptoms and tested for SARS-Cov2. 1.9% of women were found to be positive and symptomatic and 13.5% to be positive and asymptomatic. Therefore the authors conclude that the potential benefits of a universal testing approach include the ability to use Covid-19 status to determine hospital isolation practices to protect mothers, babies, and health care teams during these challenging times [13].

In limited studies on women with COVID-19 and another coronavirus infection, Severe Acute Respiratory Syndrome (SARS-CoV), the virus has not been detected in breast milk; nonetheless, we do not know whether mothers with COVID-19 can transmit the virus via breast milk [14].

Moreover, some experts speculate that, similar to the 2002–2003 SARS-Co-V epidemic [15], specific SARS-CoV-2 antibodies pass via the breast milk from the COVID-19 mother to the infant within a few days after the onset of the disease, possibly moderating the clinical expression of infant's infection [16].

1.1. Due to scarce evidence, the available recommendations are just 'expert opinion'

Chinese Pediatrics COVID-19 working group recommends maternal separation precluding breastfeeding because COVID-19 can cause severe illness. They suggest infant feeding with formula or possibly donor breast milk [17]. Marinelli [18] describes the effects of the pandemic on the management of donated human milk. In China, both donation and demand for human milk have decreased as a result of the pandemic; In Italy donations have decreased, probably because women prefer not to go to the hospital. The lack of donated human milk makes the need for breast-feeding even more evident whenever possible.

However, as breastfeeding reduces risk of infection with other pathogens that are likely to cause serious illness, the main scientific and public institutions (WHO, UNICEF, ISS, IUOG, RCOG and ABM) [19–24] safeguard maternal breastfeeding and question the Chinese recommendation to routinely separate the newborn from the COVID-19 mother.

Centers for Disease Control and Prevention (CDC) [25] state that “the determination of whether or not to separate a mother with known or suspected COVID-19 and her infant should be made on a case-by-case basis using shared decision-making between the mother and the clinical team” and considering many factors (the clinical condition of the mother and of the infant, SARS-CoV-2 testing results of mother and infant (a positive infant test would negate the need to separate), desire to feed at the breast, facility capacity to accommodate separation or colocation, the ability to maintain separation upon discharge, other risks and benefits of temporary separation of a mother with known or suspected COVID-19 and her infant).

Italian Society of Neonatology (SIN) and Union of European Neonatal & Perinatal Societies (UENPS) have delivered accurate provisional indications on the management of mother and neonate [16], coherent with WHO, UNICEF, ISS, IUOG, RCOG and ABM recommendations, summarized in Table 1.

2. Our suggestions

We recommend these suggestions to be considered valid both for women with and without diabetes

According to WHO, UNICEF, ISS, IUOG, RCOG, CDC, ABM and FIGO [26] and in particular with SIN, UENPS and Italian Health Ministry [27].

Whenever possible, the preferred option is that of joint management of mother and newborn, in order to facilitate the interaction and initiation of breastfeeding.

However the decision about whether or not to separate mother and neonate must be individualized, taking into account the parents information-consent, good health status of both the mother and her neonate and capacity to care for her neonate, the results of RT-PCR-RNA test for COVID-19, the context and the local epidemiological situation of current COVID-19 pandemic.

It's critical all doctors caring the family discuss in detail about the risks and benefits of breastfeeding with parents in order to individualize any feeding choice [23].

All women admitted to the hospital for delivery should be tested for SARS-Cov2 taking into account the context and the local epidemiological situation [13].

In case of a paucisymptomatic suspected COVID-19 mother feeling able to manage the newborn independently, mother and newborn can be managed together and breastfeeding can be started or maintained, pending mother test response (performed according to the Real Time PCR protocols for SARS-CoV-2 indicated by WHO).

If mother's test is positive, rooming-in and breastfeeding is applicable, paying attention to normal precautions of airborne respiratory diseases.

COVID-19 mothers who are breastfeeding or practising skin-to-skin contact or kangaroo mother care should practise respiratory hygiene to avoid transmitting the virus to her baby:

- The room should be isolated, not allowing visits of relatives and friends.

- The baby should be ensured a two meters safe distance.
- The mother should wear a surgical face mask during breastfeeds and intimate contact with the newborn.
- The mother should perform hand hygiene before and after contact with the child.
- Routinely clean and disinfect surfaces which the symptomatic mother has been in contact with.
- There is no need for the mother to use FFP2 or FFP3.

If expressing breast milk with a manual or electric breast pump, the mother should wash her hands before touching any pump or bottle parts and follow recommendations for proper pump cleaning after each use.

If possible, consider having someone who is well to care for and feed the expressed breast milk to the infant.

If mother has evident respiratory infection symptoms (fever, cough and respiratory secretions, myalgias, sore throat, asthenia, dyspnoea), mother and infant should be transiently separated, pending test response:

- in case of positive test, mother and infant continue to be managed separately;
- in case of negative test, rooming-in for mother and newborn is applicable with normal precautions for airborne respiratory diseases. Once mother's clinical condition has improved, the newborn can be breastfed directly.

In case of separation of mother and neonate, the expression, transportation and administration of the fresh mother's milk to newborn is recommended. Expressed breast milk should not be pasteurized, as it is not believed to be a vehicle of infection. Moreover, pasteurization reduces the biological and immunological value of human milk.

In cases of serious maternal infection, breast milk expression may not be carried and donated human milk should be considered.

The compatibility of breastfeeding with drugs eventually administered to a mother with COVID-19 should be assessed on a case-by-case basis.

Hospital discharge of a paucisymptomatic COVID-19 mother together with a healthy SARS-CoV-2 negative neonate should be done appropriately.

Going home as early as 48 h after childbirth might be an option only in cases of hospital overload. In most cases, one week hospital stay for surveillance of the newborn and repetition of the pharyngeal swab for SARS-CoV-2 at discharge is preferable.

Neonatal COVID-19 follow-up can be stopped on the 28th day after discharge, if the pharyngeal swab for SARS-CoV-2 is confirmed negative.

3. Our suggestions to women with diabetes

Breastfeeding confers health benefits to women with a history of GDM in terms of glucose tolerance in the early and late postpartum period [28,29].

Table 1 – From SIN and UENPS recommendations [16].

Health status of the mother	Pharyngeal swab for COVID-19 on the MOTHER	Pharyngeal swab for COVID-19 on the NEONATE	Isolation of the MOTHER*	Management of the NEONATE During hospital stay*	Advice on direct breastfeeding	Preventive measures for mother-neonate transmission ***
Asymptomatic or paucisymptomatic mother known to be COVID-19 positive	Already done	YES	YES, In an isolated and dedicated area of postpartum ward	In a rooming-in regimen, in an isolated and dedicated area of postpartum ward	YES	YES
COVID-19 paucisymptomatic mother under investigation	YES	Only if maternal test is positive	In an isolated and dedicated area of postpartum ward, pending result of the lab test	In a rooming-in regimen, in an isolated and dedicated area of postpartum ward, at least until the result of the lab test	YES	YES
Mother with symptoms of respiratory infection (fever, cough and secretions) and too sick to care for the newborn, COVID-19 positive or under investigation	YES or already being done	Only if maternal test is positive	In an isolated and dedicated area of postpartum ward, pending result of the lab test	Neonate isolated and separated from the mother, at least until the result of the lab test. He is placed in a dedicated and isolated area in the Neonatology Unit (if asymptomatic) or in the NICU (if symptomatic; e.g. with respiratory disease)	NO; use of expressed milk.** Pasteurization not recommended	YES

* In addition, adequate protection measures on the part of health care personnel, according to the indication of the Ministry of Health of Italy.

** Mother's fresh milk should be expressed with a dedicated manual or electrical breast pump. The mother should always wash her hands before and after touching bottles and all breast pump parts, following recommendations for proper washing of the breast pump after each use.

*** Room divider or curtain, surgical face mask for the mother during breastfeeds and intimate contact with the newborn, careful washing of hands, placing the baby's cradle at a distance of 2 m from the mother's head, no visits of relatives and friends. No need of the mother to use FFP2 or FFP3 face mask (Radonovich, Simberkoff & Perl 2019; UENPS 2020).

Women with diabetes have to intensify their glycemic control during COVID infection as well as during any other infectious disease that could be responsible for metabolic imbalance [30].

During puerperium more attention is to be paid to the balance of fluids that can be influenced both by postpartum fluid retention and blood sugar levels. Patients with severe Covid-19 disease are subjected to administration of cortisone with possible subsequent glycemic imbalance even in women with prior gestational diabetes [31].

A light meal before suckling is recommended in women on insulin treatment to prevent post meal hypoglycemia (90–180 min after suckling) [32].

Breastfeeding leads to a decreased need in total daily basal insulin caused by increased glucose use during lactation, thus insulin dose should be carefully evaluated in breastfeeding women [33].

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We thank all the participants for their contributions to this study.

Contributors

All authors contributed equally. All authors have approved the final manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

- [1] Davanzo R, Romagnoli C, Corsello G. Position statement on breastfeeding from the Italian pediatric societies. *Italian J Pediatrics* 2015;41(80):1–3.
- [2] Wang C, Zhou YH, Yang HX, Poon LC. Intrauterine vertical transmission of SARS-CoV-2: what we know so far. *Ultrasound Obstet Gynecol* 2020 Apr 7. <https://doi.org/10.1002/uog.22045>.
- [3] Wang S, Guo L, Chen L, et al. A case report of neonatal COVID-19 infection in China [published online ahead of print, 2020 Mar 12]. *Clin Infect Dis*. 2020;ciaa225. doi:10.1093/cid/ciaa225.
- [4] Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 2020. [https://doi.org/10.1016/S0140-6736\(20\)30360-3](https://doi.org/10.1016/S0140-6736(20)30360-3).
- [5] Chen Yan, Peng Hua, Wang Lin, Zhao Yin, Zeng Lingkong, Gao Hui, Liu Yalan. Infants born to mothers with a new coronavirus (COVID-19). *Front Pediatr* 2020;16(8):104. doi: 10.3389/fped.2020.00104. eCollection 2020 Mar.
- [6] Dong Lan, Tian Jinhua, He Songming, Zhu Chuchao, Wang Jian, Liu Chen, Yang Jing. Possible vertical transmission of SARS-CoV-2 from an infected mother to her newborn. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.4621>.
- [7] Zeng Hui, Xu Chen, Fan Junli, Tang Yueting, Deng Qiaoling, Zhang Wei, Long Xinghua. Antibodies in infants born to mothers with COVID-19 pneumonia. *JAMA* 2020. <https://doi.org/10.1001/jama.2020.4861>.
- [8] Kimberlin David W, Stagno Sergio. Can SARS-CoV-2 infection be acquired in utero?: more definitive evidence is needed. *JAMA* 2020. Mar 26. doi: 10.1001/jama.2020.4868. [Epub ahead of print] PubMed PMID: 32215579.
- [9] Chen S, Huang B, Luo DJ, Li X, Yang F, Zhao Y, Nie X, Huang BX. Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of three cases. *Zhonghua Bing Li Xue Za Zhi*. 2020 Mar 1;49(0): E005. doi: 10.3760/cma.j.cn112151-20200225-00138. [Epub ahead of print] Chinese.
- [10] Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in different types of clinical specimens 11(2762997). *JAMA* 2020. <https://doi.org/10.1001/jama.2020.3786>.
- [11] Karimi-Zarchi Mojgan, Neamatzadeh Hossein, Dastgheib Seyed Alireza, Abbasi Hajar, Mirjalili Seyed Reza, Behforouz Athena, et al. Vertical transmission of coronavirus disease 19 (COVID-19) from infected pregnant mothers to neonates: a review. *Fetal Pediatr Pathol* 2020. Apr 2:1-5. doi: 10.1080/15513815.2020.1747120. [Epub ahead of print] PubMed PMID: 32238084.
- [12] Dashraath Pradip, Wong Jing Lin Jeslyn, Lim Mei Xian Karen, Lim Li Min, Li Sarah, Biswas Arijit, et al. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. *Am J Obstet Gynecol* 2020;222(6):521–31. <https://doi.org/10.1016/j.ajog.2020.03.021>.
- [13] Sutton Desmond, Fuchs Karin, D'Alton Mary, Goffman Dena. Universal screening for SARS-CoV-2 in women admitted for delivery. *N Engl J Med* 2020;382(22):2163–4. <https://doi.org/10.1056/NEJMc2009316>.
- [14] Panahi L, Amiri M, Pouy S. Risks of novel coronavirus disease (COVID-19) in pregnancy; a narrative review. *Arch Acad Emerg Med* 2020;8 e34.
- [15] Robertson CA, Lowther SA, Birch T, Tan C, Sorhage F, Stockman L, et al. SARS and pregnancy: a case report. *Emerging Infect Dis J* 2004;10:345–8.
- [16] Davanzo R, Moro G, Sandri F, Agosti M, Moretti C, Mosca F. Breastfeeding and Coronavirus Disease-2019. Ad interim indications of the Italian Society of Neonatology endorsed by the Union of European Neonatal & Perinatal Societies. *Matern Child Nutr* e13010 (2020). doi:10.1111/mcn.13010 [Epub ahead of print].
- [17] Wang Laishuan, Shi Yuan, Xiao Tiantian, Fu Jianhua, Feng Xing, Mu Dezhi, et al. Working committee on perinatal and neonatal management for the prevention and control of the 2019 novel coronavirus infection. Chinese expert consensus on the perinatal and neonatal management for the prevention and control of the 2019 novel coronavirus infection (First Edition). *Ann Transl Med* 2020;8(3):47. <https://doi.org/10.21037/atm.2020.02.20>.
- [18] Marinelli Kathleen A. International perspectives concerning donor milk banking during the SARS-CoV-2 (COVID-19) pandemic. *J Hum Lact* 2020. Mar 30:890334420917661. doi: 10.1177/0890334420917661. [Epub ahead of print].
- [19] WHO (2020). Clinical management of severe acute respiratory infections (SARI) when COVID-19 disease is suspected. Interim Guidance. 13 March, Geneva. <https://apps.who.int/iris/bitstream/handle/10665/331446/WHO-2019-nCoV->

- clinical-2020.4-eng.pdf?sequence=1&isAllowed=y Accessed on March 24th, 2020.
- [20] UNICEF, Global, N. C. & For, N. G. T. A. M. Infant & young child feeding in the context of COVID-19. 2, 1–9, 2020.
- [21] Istituto superiore di sanità. Nuovo Coronavirus consigli dell'Istituto superiore di sanità per le donne in gravidanza o durante l'allattamento. http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=4119.
- [22] Poon LC, Yang H, Lee JCS, Copel JA, Leung TY, Zhang Y, et al. ISUOG Interim Guidance on 2019 novel coronavirus infection during pregnancy and puerperium: information for healthcare professionals. *Ultrasound Obstetrics Gynecol* 2020. doi: 10.1002/uog.22013. [Epub ahead of print].
- [23] Royal College of Obstetricians and Gynaecologists, Royal College of Midwives, Royal College of Paediatrics and Child Health, Public Health England and Health Protection Scotland. Coronavirus (COVID-19) Infection in Pregnancy. Information for healthcare professionals. Version 4: Published Friday 3 April 2020.
- [24] Academy of breastfeeding Medicine. ABM STATEMENT ON CORONAVIRUS 2019 (COVID-19). MARCH 10 2020.
- [25] <https://www.cdc.gov/coronavirus/2019-ncov/hcp/inpatient-obstetric-healthcare-guidance.html>.
- [26] Poon Liona C, Yang Huixia, Kapur Anil, Melamed Nir, Dao Blami, Divakar Hema, et al. Global interim guidance on coronavirus disease 2019 (COVID-19) during pregnancy and puerperium from FIGO and allied partners: Information for healthcare professionals. *Int J Gynecol Obstet* 2020;149(3):273–86. <https://doi.org/10.1002/ijgo.v149.310.1002/ijgo.13156>.
- [27] Ministero della Salute, Direzione Generale della Prevenzione Sanitaria, Direzione Generale della Programmazione Sanitaria & Direzione Generale per l'Igiene e la Sicurezza degli ambienti e la Nutrizione. COVID-19: indicazioni per gravida-partoriente, puerpera, neonato e allattamento. 2020.
- [28] Mattei L, Colatrella A, Bitterman O, Bianchi P, Giuliani C, Roma G, et al. Long lasting effects of breastfeeding on metabolism in women with prior gestational diabetes. *J Diabetes Mellitus* 2014;4:257–63.
- [29] Gunderson Erica P, Lewis Cora E, Lin Ying, et al. Lactation duration and progression to diabetes in women across the childbearing years the 30-year CARDIA study. *JAMA Intern Med* 2018;178(3):328–37.
- [30] Colatrella A, Framarino M, Toscano V, Bongiovanni M, Festa C, Mattei L, et al. Continuous glucose monitoring during breastfeeding in women with recent gestational diabetes mellitus. *Diabetes Technol Ther* 2012;14:576–82.
- [31] Roberts A, James J, Dhatariya K. Joint British Diabetes Societies (JBDS) for Inpatient Care. Management of hyperglycaemia and steroid (glucocorticoid) therapy: a guideline from the Joint British Diabetes Societies (JBDS) for Inpatient Care group. *Diabet Med* 2018 Aug;35(8):1011–7. <https://doi.org/10.1111/dme.13675>.
- [32] Riviello C, Mello G, Jovanovic LG. Breastfeeding and the basal insulin requirement in type 1 diabetic women. *Endocr Pract* 2009;15:187–93.
- [33] Achong N, McIntyre HD, Callaway L, Duncan EL. Glycaemic behaviour during breastfeeding in women with Type 1 diabetes. *Diabetic Med* doi: 10.1111/dme.12993. October 2015.