

# Transmission of Novel Coronavirus (COVID-19) through breast milk and breastfeeding: A living systematic review

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## Introduction

Coronavirus disease (COVID-19) is caused by the infection with a novel coronavirus strain, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As the global pandemic evolved, we aimed to systematically search and synthesize all available information on potential viral transmission from mother-to-child particularly, through breastmilk and breastfeeding. This document updates our living systematic review (1) and seeks to capture relevant information to inform guidance on breastmilk and breastfeeding in the context of COVID-19.

## Methods

This update includes the same methods as described in our previous report (1) and expands our search from July 7, 2020 to December 11, 2020. Briefly, we designed and piloted a structured search strategy. The search was carried out on December 11, 2020, in the following electronic databases: MEDLINE (PubMed), the WHO COVID-19 Global literature on coronavirus disease (<https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/>), Cochrane Library, Web of Science Core Collection, and EMBASE. We also searched the COVID-19 subset of the World Health Organization International Clinical Trials Registry Platform (ICTRP) to identify ongoing and unpublished studies. The WHO COVID-19 global literature database is a comprehensive multilingual database on COVID-19 updated daily (Monday through Friday) from searches of bibliographic databases, hand searching, and the addition of other expert-referred scientific articles.

Types of participants: Pregnant or lactating women with suspected, probable or confirmed SARS-CoV-2 infection as well as their children (0-24 months of age) regardless of breastfeeding status, with suspected or confirmed SARS-CoV-2 infection were eligible for inclusion. Case definitions are based on WHO Global surveillance interim guidance for COVID-19(2).

Types of exposure: Apparently healthy infants or young children consuming breast milk directly from the breast or expressed breast milk from a woman with confirmed SARS-CoV-2 infection were considered

exposed.

Types of outcomes: The primary outcome was any infant with suspected, probable or confirmed SARS-CoV-2 infection within 30 days of breastfeeding or receiving expressed breast milk from a woman with a suspected, probable or confirmed SARS-CoV-2 infection. The secondary outcomes include the presence of SARS-CoV-2 RNA in breast milk by RT-PCR, infant adverse effects, and neonatal mortality or morbidity

## Results

In this update, we report all included articles captured by our systematic search up to December 11, 2020, which includes those reported in the first publication. The search identified a total of 88,694 records.

After deduplication, 11,502 titles and abstracts were screened against the inclusion criteria. Out of 1,679 full texts assessed, we identified 67 articles with breast milk samples that were analyzed for SARS-CoV-2. Two of these articles (3, 4) refer to the same cases; one article provides an update with a larger population (4) therefore, only that one is included in the analysis. A pre-print article is also included in the analysis (5).

Among the included studies, a total of 485 breast milk samples from different women were reported, from which 413 breast milk samples were assessed by RT-PCR to detect SARS-CoV-2 RNA (3-64) and , 72 breast milk samples were assessed with ELISA for antibody detection only (65-69).

From the breast milk samples assessed by RT-PCR, 13 breast milk samples belonging to different women were positive for SARS-CoV-2 RNA (4, 6, 8, 10, 13, 29, 37, 48, 52, 54, 58, 62, 64). A viral isolate was cultured *in-vitro* from one of the positive breast milk samples. However, no viral replication was detected (8).

Among the 13 mothers-infant pairs with positive breast milk samples there were five neonates (6, 13, 37, 52, 58) and one infant (62) with confirmed SARS-CoV-2 infection by RT-PCR. Of these children, four neonates (6, 37, 52, 58) and one infant (62) had some breast milk intake, and one was fed with infant formula (13). Other five neonates had negative RT-PCR tests (4, 10, 29, 48, 54), one of them was mix-fed (29), one was fed with infant formula (54), and three others did not include infant feeding practices or the information regarding feeding practices was combined with a larger number of cases (4, 10, 48) . Finally, infection outcomes or feeding practices were reported in two infants (8, 64). These results, pertaining to cases with a positive breast milk sample by RT-PCR detection of viral RNA are summarized in table 1.

<b>Table 1: Infant outcomes among cases with SARS-CoV-2 RNA detected in breast milk samples available (Studies providing results n= 13)</b>				
<b>Neonates (&lt;= 28-days-old)</b>				
	<b>Positive COVID-19</b>	<b>Negative COVID-19</b>	<b>Total</b>	<b>Studies</b>
<b>Breastfeeding</b>	3	0	3	Positive cases: (6, 37, 58)
<b>Breast milk substitute (infant formula)</b>	1	1	2	Positive cases: (13) Negative cases: (54)
<b>Mix-Feeding</b>	1	1	2	Positive cases: (52) Negative cases: (29)
<b>Not reported feeding practice</b>	0	3	3	Negative cases: cases (4, 10, 48)
<b>Infants (&gt;28 days-old)</b>				
<b>Breastfeeding</b>	0	0	0	
<b>Breast milk substitute (infant formula)</b>	1	0	0	Positive cases: (62)
<b>Mix-feeding</b>	0	0	0	
<b>Not reported feeding practice</b>	0	0	0	
<b>Total</b>	6	5	11	
2 cases with a positive breast milk sample did not reported infant outcomes (8, 64)				

Additionally, among the 66 included studies there were 26 neonates with confirmed SARS-CoV-2 infection, 17 of them had some breast milk intake and in six cases there were no feeding practices reported. Other 314 neonates had negative SARS-CoV-2 RT-PCR tests, 68 of them had some breast milk intake and in 222 cases no infant feeding practices were reported. There were eight infants with SARS-CoV-2 infection and seven with some intake of breast milk. These results are summarized in table 2.

**Table 2: Infant outcomes among cases with breast milk samples available  
(Studies providing results n= 66)**

Neonates (<= 28-days-old)				
	Positive COVID-19	Negative COVID-19	Total	Studies
<b>Breastfeeding</b>	15	29	44	Positive cases: (6, 12, 25, 37, 38, 45, 58, 61, 69, 70) Negative case: (6, 11, 15, 21, 39, 55, 60, 68, 69)
<b>Breast milk substitute (infant formula)</b>	3	24	27	Positive cases: (13, 35, 47) Negative cases: (6, 14, 19, 36, 42, 44, 46, 54, 57)
<b>Mix-Feeding</b>	2	39	41	Positive cases: (29, 52) Negative cases: (11, 18, 24, 29, 51)
<b>Not reported feeding practice</b>	6	222	228	Positive cases: (5, 8, 17, 30, 37) Negative cases(4, 5, 9-12, 16, 17, 20, 26, 28, 31, 32, 34, 36, 41, 48, 49, 53, 56, 59, 63)
Infants (>28 days-old)				
<b>Breastfeeding</b>	3	1	4	Positive cases: (7, 40, 50) Negative cases: (66)
<b>Breast milk substitute (infant formula)</b>	0	0	0	
<b>Mix-feeding</b>	4	0	4	Positive cases: (27, 33, 43, 62)
<b>Not reported feeding practice</b>	1	1	2	Positive: (8) Negative: (8)
<b>Total</b>	34	316	350	

2 other cases from (8) were presumptive and one not tested

## Final remarks

The present update adds 29 new studies with 343 breast milk samples from different women, tested for SARS-CoV-2 genomic material or antibodies. In combination with previous results, there were a total of 13 breast milk samples, from different women, with detectable levels of SARS-CoV-2 RNA; only from one sample, it was attempted to culture the viral isolate and, in that way, assess the potential infectious capacity of the virus. With the available evidence, it is uncertain whether SARS-CoV-2 can be transmitted via breast milk intake. The presence of viral RNA does not confirm the presence of infectious viral particles in breast milk and the possible transmission through other breastfeeding-related bodily fluids such as blood, sweat, respiratory droplets, or droplet transmission due to close contact with the infant or young child via skin-to-skin exposure or airborne transmission cannot be disregarded.

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