

Retrospective Study on Breastfeeding Practices by SARS-COV-2 Positive Mothers in a High Risk Area for Coronavirus Infection

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What is already known on this topic?

- Public health authorities globally have recommended continuing breastfeeding, in the presence of severe safety measures for infection, while others have been more restrictive. Current guidance for mothers with suspected or confirmed coronavirus disease 2019 (COVID-19) highly recommend continuing breastfeeding.

What this study adds on this topic?

- Breastfeeding practices can be established and maintained through rooming-in, thus promoting the mother-child bond without compromising the safety of the newborn.
- The study showed higher rates of breastfeeding at discharge in the group of newborns practicing rooming-in compared to the neonates that were separated from the mothers immediately after birth.

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ABSTRACT

Background: During the pandemic of SARS-CoV-2, among other clinical and public health issues, a major concern raised by SARS-CoV-2 is the possibility of transmission of the infection from mother to child in the perinatal period. This has placed a question mark on the safety of breastfeeding, with ambiguity on the joint management of SARS-CoV-2 positive or suspected mothers and their children. It was aimed to evaluate breastfeeding rates for newborns of asymptomatic SARS-CoV-2 positive mothers who were temporarily separated from their babies at birth, compared to those who were not separated.

Results: Babies who were not isolated from their mothers at delivery were significantly more likely to be breastfed and were at no higher risk of infection with SARS-CoV-2.

Conclusion: Following the World Health Organization (WHO) recommendations and strict hand and mask hygiene measures, breastfeeding practices can be established and maintained through rooming-in, thus promoting the mother-child bond without compromising the safety of the newborn.

Keywords: Breast milk, coronavirus, COVID-19, lactation, perinatal, vertical transmission

INTRODUCTION

The novel coronavirus-related infection has rapidly spread from Wuhan (China) since December 2019¹ and was declared a pandemic on March 11, 2020.² Initially defined as the 2019-novel coronavirus (2019-nCoV),³ the pathogen has been officially named SARS-CoV-2 on February 11, 2020, and coronavirus disease 2019 (COVID-19) were named its related disease.⁴

Several clinical and public health issues are related to COVID-19.⁵ However, the possibility of viral transmission from mother to child in the perinatal period and breastfeeding safety are of major concern.^{6,7} Whether infants should be separated from mothers with suspected or confirmed COVID-19 is still debated,⁸ and skin-to-skin contact, kangaroo care, and the rooming-in practice are widely disputed⁹ after over 1 year from the onset of the pandemic. Despite early World Health Organization (WHO) recommendations,⁹ the safety of breastfeeding is still being questioned,^{1,3} and some have contended that a prudent course of action would be to isolate infants from mothers with suspected or confirmed COVID-19 in order to reduce the risk of mother-to-child transmission.^{9,10}

Respiratory viruses, like SARS-CoV-2, are not easily transmitted in utero.¹¹ While most neonates born to infected women test negative for SARS-CoV-2, a recent review performed

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on a large cohort of neonates report that 1.9% (95/4907) of subjects tested positive at age 24 h or less.¹² The WHO working group, COVID-19 Living Evidence Synthesis (LENS), has proposed a consensus initial classification system for the timing of vertical transmission of SARS-CoV-2.¹³ However, available data remain insufficient to conclude that SARS-CoV-2 can be transmitted postnatally from infected mothers to infants through breast milk.¹⁴ The WHO's guidelines on infection prevention and control recommend that mothers with suspected or confirmed COVID-19 should not be separated from their infants while being trained on preventive measures to avoid spreading the virus to their infants through respiratory secretions.^{15,16} The WHO recommendations have been incorporated in the guidelines of national societies throughout the world, including the Turkish and Italian neonatal societies, which have proposed comprehensive protocols based on available evidence, on how to handle the mother-child dyad and the breastfeeding of neonates during the SARS-CoV-2 outbreaks.^{17,18} Skin-to-skin contact should be practiced and breastfeeding initiated from birth is not suspended, as the benefits of breastfeeding practiced in strict compliance with prevention and control measures outweigh the potential risks of viral transmission.^{15,16}

In a multicenter cohort study conducted among infants born to 125 mothers with COVID-19 in 34 neonatal intensive care units (NICUs) in Turkey, it was found that the majority of infants (86.4%) were followed in an isolation room in NICU, or 2 m away from the mother (8.8%), or in a separate room (4.8%). In this cohort, the rate of use of formula (56.8%) and expressed breast milk (36%) was higher than that of exclusive breastfeeding with caution (7.2%), whereas COVID-19 positive infants ($n = 4$) were formula-fed.¹⁹

In an additional prospective multicenter cohort study conducted in 24 NICUs in Turkey among symptomatic outpatient infants with COVID-19, it was shown that 9 mothers out of 37 continued to breastfeed while most were fed express milk (52%) and formula (11%) despite the recommendations provided by the Turkish Neonatal society.²⁰

In an effort to contribute data supporting the WHO's recommendations to continue breastfeeding during the COVID-19 pandemic, this retrospective, single-center study compared breastfeeding rates for newborns of asymptomatic COVID-19-positive mothers who were temporarily separated from their mothers at birth, compared to those who were not separated and to infants of healthy mothers.

METHODS

A retrospective cohort study was performed in the neonatal and mother-baby units of the tertiary care, University Hospital of Foggia, Italy, which during the pandemic period has been classified as one of the areas at highest risk of COVID-19 infection in Southern Italy. Due to insufficient available data on COVID-19 transmission, vertical and perinatal mother-to-newborn virus transmission, and the lack of clear guidelines,¹⁰ after the onset of the pandemic, all SARS-CoV-2 positive mothers were admitted to dedicated areas of the neonatal units.

Mother-infant pairs admitted to the units during the period from March 15, 2020, to March 31, 2021, were enrolled in the study and divided into 3 groups: group A included newborns of asymptomatic or with mild symptoms COVID-19-positive mothers who were temporarily separated from their mothers at birth; group B included newborns of asymptomatic or with mild symptoms COVID-19-positive mothers who were not separated from their mothers at birth; and control group B included infants born to uninfected, healthy mothers.

Inclusion criteria were neonates with gestation age of 38-42 weeks, birth weight of 2500-4000 g, and product of normal vaginal delivery (VD) or caesarian section (CS). Exclusion criteria were mothers with severe COVID-19 infection symptoms.

During the period from March 15, 2020, to December 15, 2020, all mother-infant pairs were temporarily separated and isolated at birth. Infants born to mothers testing positive for SARS-CoV-2 were admitted to a dedicated area of the NICU designated as "quarantine zone" (group A) and kept separate from infants born to healthy mothers.

From December 15, 2020, to March 31, 2021, all mother-child dyads were also admitted to the designated COVID-19 area. Newborns were, however, not separated from their mothers, in accordance with the updated guidance of the Italian Society of Neonatology¹⁸, the American Academy of Pediatrics^{21,22}, and the World Health Organization^{9,10} (group B). A control group of neonates born to healthy COVID-19-negative mothers was randomly selected and enrolled during the same study period (group C). Protective equipment was used by all healthcare personnel, and strict preventive and hygiene measures were adopted.^{23,24}

All mothers were encouraged to breastfeed their infants or express their breast milk to establish and maintain adequate milk supply in infected mothers.^{9,10} Mothers were trained to adopt all precautions useful to avoid contamination of the virus including careful hand washing, surgical facemask donned during breastfeeding or when providing care for the infant.^{9,10} Mothers did not wear gloves, gowns, or goggles. Visits to the mother and infant, including paternal visits, were restricted throughout their hospital stay.

After birth, all newborns were tested for SARS-CoV-2 by rRT-PCR by a nasopharyngeal swab sample at 12-24 h. During hospitalization, mother-infant pairs were cared for by nurses and midwives and periodically checked in accordance with a programmed daily schedule.

At the sixth day and 30 days after discharge from the hospital, neonates were tested for SARS-CoV-2 by rRT-PCR on a nasopharyngeal swab sample and assessed for fever, hypothermia, respiratory distress, lethargy, cough, rhinorrhea, irritability, rash, diarrhea, and feeding intolerance. Mothers-child dyads were assessed at scheduled weekly time points in outpatient clinic visit for self-reported symptoms of fever, cough, anosmia, ageusia, shortness of breath, sore throat, rhinorrhea, myalgias, vomiting, and diarrhea.

Data used in this study were obtained from electronic medical records of participants, from inpatient medical records collected at the time of birth, on the occasion of the outpatient visits on days 5-7, and by telemedicine visits or outpatients visits or phone-calling the parents at the third month of life.

The feeding methods adopted by mothers enrolled in the study, including direct breastfeeding, expressed breast milk, formula, or mixed feeding were recorded at the time of birth, at discharge, and at 3 months of life. Data on Apgar scores, clinical variables, including gestational age, sex, birth weight, and type of delivery, whether vaginal or CS, were also recorded.

Statistical Analysis

Data were controlled, coded, and analyzed using Stata MP16 (Stata Corp LLC) software. Quantitative variables were expressed as mean and standard deviation and categorical variables as proportions. Normality of continuous variables was assessed using the Skewness and kurtosis test, and for those not normally distributed, a normalization model was constructed using the logarithmic function. Continuous variables were compared across multiple groups using the one-way ANOVA test, using Bonferroni correction to compare the variable by a single group. The Fisher's exact test was used to compare the percentages of breastfeeding rate between groups; a P value $< .05$ was considered significant.

Ethics

The study was performed, in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards,²⁵ following the ethics recommendations for retrospective studies and ethical approval was received by the Ethics Committee of the Pediatric Research Center of the University of Foggia (PCUF.002A, March 16, 2021). Data reported or discussed in this article were anonymous, with no personal or identifiable data being collected.

RESULTS

The overall prevalence of mothers positive to COVID infection in our center was 2.2%, over the total number of deliveries attended during the study period (44/2000).

A total of 60 mother-infant pairs meeting the inclusion criteria were enrolled in the study. Group A: 13 neonates were

temporarily separated and isolated at birth from their mothers testing positive for SARS-CoV-2; group B: 10 neonates born to SARS-CoV-2 positive mothers were not separated from their mothers at birth; group C: 37 neonates belonged to the control group including COVID-19 negative mothers.

There were no significant differences between the mother-child dyads with regard to age, sex, type of delivery, and anthropometrics at enrollment in the study groups. Demographic characteristics of the study groups are shown in Table 1.

The breastfeeding rate at discharge was respectively 23.1% in the group A, 80% in the group B, and 54.1% in the group C (group A vs. group B, $P = .001$; group B vs. group C, $P = .138$; group A vs group C, $P = .054$) (Figure 1 and Table 2). All newborns included in the study tested PCR negative for SARS-CoV-2 swab at controls on day 1 and 6 and 30 days after birth. At the final control, on 3 month from birth, all infants included in the study that were breastfed at discharge were still breastfeeding. Finally, no vertical transmission COVID-19 was detected during the study.

DISCUSSION

In this retrospective study on a selected cohort of neonates born to asymptomatic mothers with SARS-CoV-2 infection, we investigated the impact of this condition on breastfeeding rates. The study showed higher rates of breastfeeding at discharge in the group of newborns practicing rooming-in (group B), compared to the neonates that were separated from the mothers immediately after birth (group A). The newborns practicing rooming-in showed higher rates of breastfeeding also compared to the control group C of neonates born to COVID-19-negative mothers (80% vs 54%). All infants kept breastfeeding through the end of the study.

Knowledge on COVID-19 and its impact on breastfeeding is currently limited, although rapidly evolving. Public health authorities globally have recommended continuing breastfeeding, in presence of severe safety measures for infection, while others have been more restrictive.^{9,10}

During the first month after the onset of the pandemic, despite available data on the safety of breastfeeding, our neonatal center took a conservative approach by temporarily separating newborns from their infected mothers immediately after delivery. These neonates were fed by expressed breast milk,

Table 1. Demographic Characteristics of Newborns (A) and Mothers (B) Enrolled in the Study

	Group A	Group B	Group C	P
(A) Demographic characteristics of newborn				
Male/female	7/6	5/6	23/14	.619*
CS/VD	8/5	5/6	22/15	.835*
Birth weight; mean $\pm$ SD	3124.5 $\pm$ 276.0	3263.5 $\pm$ 473.0	3452.5 $\pm$ 376.0	.373**
Gestational age	37 $\pm$ 0.6	38 $\pm$ 0.1	38 $\pm$ 0.9	.76**
(B) Demographic characteristics of mothers				
Number	13	11	37	
Age	30 $\pm$ 0.5	30 $\pm$ 0.7	31 $\pm$ 0.2	
Primiparous	11/2	7/3	28/9	

*Fisher's exact test.
 **ANOVA one-way test.
 Primiparous means the women who deliver the baby for the first time.

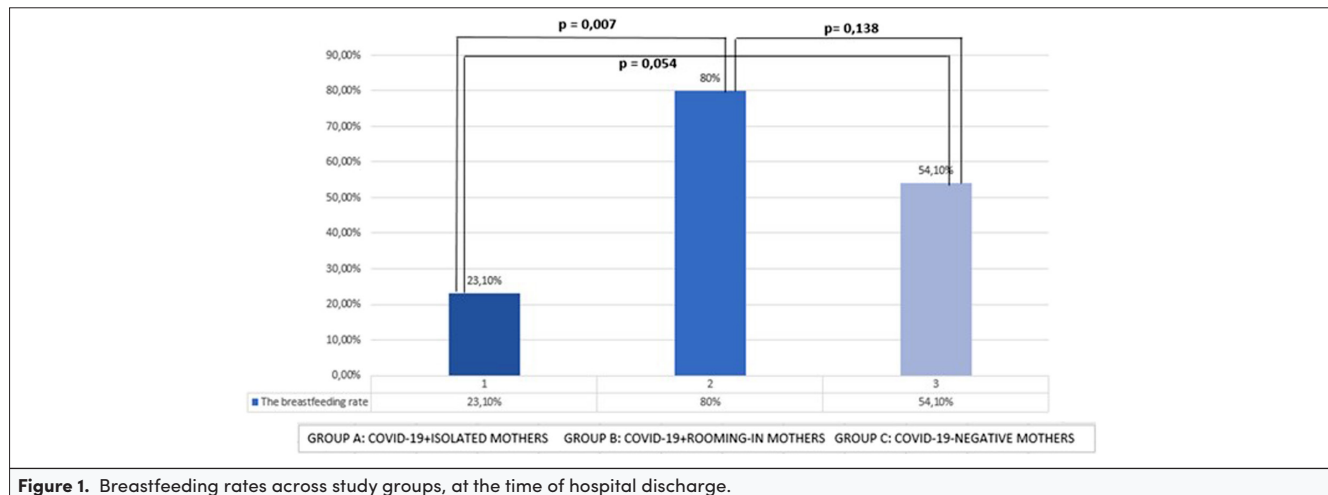


Figure 1. Breastfeeding rates across study groups, at the time of hospital discharge.

Table 2. Breastfeeding Rates across Study Groups

	Group A	Group B	Group C	Total	P	P*	P**	P***
Breastfeeding; n (%)	3 (23.1)	8 (80.0)	17 (54.1)	28 (46.6)	0.023	.007	.054	.138
Formula milk; n (%)								
Formula milk	9 (100.0)	2 (66.7)	9 (45)	20 (62.5)	.014	.250	.009	1.000
Mixed feeding	0 (0.0)	1 (33.3)	11 (55)	12 (37.5)				

*Overall P-value [ANOVA one-way test].
 **Group A vs. group B P value [ANOVA one-way test, Bonferroni correction].
 ***Group A vs. group C P value [ANOVA one-way test, Bonferroni correction].
 ****Group B vs. group C P value [ANOVA one-way test, Bonferroni correction].
 P value < .05 was considered significant.

rather than breastfeeding during the period of high maternal infectivity.²⁶ Such an approach reflected the strict instructions issued by the hospital management in an effort to control the spread of infection. However, as a consequence, both breastfeeding initiation and duration rates declined, raising great concern for the potential negative outcomes on infant's health. Breastfeeding is, in fact, a recognized means of ensuring optimal nutrition for an infant and a proven primary prevention strategy building a foundation for life-long health and wellness, which favors the decreasing of both infant mortality and morbidity.²⁷ The provision of human milk optimizes a child's short- and long-term brain development, intelligence, and developmental outcomes.²⁷ Therefore, on the occasion of the second pandemic wave, a dedicated area was established in the unit, where positive mothers could be accommodated in separate personal rooms with their babies, in order to facilitate the rooming-in and breastfeeding practices.

A recent cross-sectional study, performed in Belgium by an online survey on a large number of pregnant women regarding the impact of COVID-19 on their breastfeeding practices, reports that a large majority of respondents (90%) denied that the pandemic affected their breastfeeding practices or somehow responsible for the cessation of breastfeeding.²⁸ Half of the women even considered giving longer breast milk because of the coronavirus. In contrast, women's medical counseling and social support were negatively impacted by the lockdown. Moreover, women without previous breastfeeding experience and in the early postpartum period experienced a higher burden in terms of reduced medical counseling and support. Data from a further survey involving mothers in 5 European countries

show that the proportion who reported that COVID-19 had a negative impact on their breastfeeding or pumping behaviors ranged from 8 to 21%, respectively, in Germany and in France.²⁹

In the multicenter study by Oncel et al.,¹⁹ the worst breastfeeding rates were justified by the isolation of patients in NICUs, the health status of mothers, and the anxiety of both parents and physicians about the possible contamination of breast milk, thus suggesting that family support should be an integral part of care in NICUs.¹⁹ The same results were also obtained by the Neo-COVID-19 research group from Spain in a multicenter study, in which infants discharged with breastfeeding were only 41.7%, a finding well under their expectations.³⁰ It is necessary to be aware that breastfeeding in NICU during the SARS-CoV-2 pandemic is a major challenge. In a further study, 74% of infants continued to be breastfed through the efforts of NICU staff.²⁰ The visits, especially if the mother is SARS-CoV-2 positive, and express milk transfer in the NICU, are steps that must be done carefully and with well-established methods to avoid threatening the health of the NICU staff and other infants.

Although conducted on a limited sample, our study confirms and supports the importance of continuing rooming-in and breastfeeding during COVID-19 as they are safe practices for the mother-child dyad, if associated with adequate parental education on safety measures and infection control practices. Furthermore, appropriate information provided to mothers about the importance of breast milk for the health and well-being of their children may have positively contributed to maintaining the optimal breastfeeding rates observed in the two study groups of infected mothers. Better breastfeeding

rates were observed, particularly in group B, made by mothers that were not separated from their babies. The increased clinical monitoring of maternal health and the counseling provided by the perinatal health professionals, particularly to COVID-19-infected mothers, may explain the significantly higher breastfeeding rates observed in the 2 study groups including COVID-19-positive mothers, compared to the control group of uninfected mothers.

The risk of mother-to-infant transmission of SARS-CoV-2 during rooming-in seems to be unlikely, provided that infected mothers are not severely affected by COVID-19 and are educated to observe droplet and contact precautions when breastfeeding their infants.^{9,10} The recently updated WHO's guidelines recommend that mothers with suspected or confirmed COVID-19 infection should be encouraged to initiate and continue breastfeeding because the benefits of breastfeeding substantially outweigh the potential risks of transmission.^{9,10} In our study, no cases were recorded of mother-to-infant transmission of SARS-CoV-2 during protected rooming-in practice and mothers remained asymptomatic.

Our study further shows that by following the WHO recommendations on breastfeeding during COVID-19 and insisting particularly on handwashing, wearing masks, and related hygiene measures, the mother-child bond and breastfeeding could be maintained, without compromising the safety of the newborn. These various precautions to avoid virus infection that are universally available should not be interpreted as measures to discourage breastfeeding but to prevent the risk of contamination.

CONCLUSIONS

Current guidance for mothers with suspected or confirmed COVID-19 highly recommends continuing breastfeeding.^{17,18} However, supportive data are still limited and need further updates and detailed information. We are aware of the limitations of this single-center study as the sample size was relatively small and larger epidemiological and multicenter clinical cohort studies are needed to consolidate our observations. Moreover, the implementation of collaborative networks will further contribute to exclude a vertical transmission and improve the understanding of the impact of SARS-CoV-2 infection in neonates.

However, our data may contribute to further implement WHO recommendations on safety preventive measures^{9,10,17} as they show that mother-child bond and breastfeeding could be maintained without compromising the safety of newborns. SARS-CoV-2-infected mothers in good clinical condition and willing to take care of their babies should be encouraged to practice rooming-in and breastfeeding after being carefully instructed about the appropriate droplet and contact precautions. Hence, considering the proven benefits of breastfeeding, we believe that developing prevention programs and strategies will greatly help to expand the number of infants born to mothers with suspected or confirmed COVID-19 that receive breast milk in their first days of life and onwards.

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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