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Effects of COVID-19 pandemic on breastfeeding rates in a neonatal intensive care unit

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Abstract

Objectives: To find out if the expressed breast milk delivery rate to neonatal intensive care unit (NICU) for babies who were hospitalized for any reason other than COVID-19, and exclusive breastfeeding (EB) rates between discharge date and 30th day of life of those babies were affected by COVID-19 pandemic.

Methods: Babies who were hospitalized before the date first coronavirus case was detected in our country were included as control group (CG). The study group was divided into two groups; study group 1 (SG1): the mothers whose babies were hospitalized in the period when mother were asked not to bring breast milk to NICU, study group 2 (SG2): the mothers whose babies were hospitalized after the date we started to use the informed consent form for feeding options. The breast milk delivery rates to NICU during hospitalization and EB rates between discharge and 30th day of life were compared between groups.

Results: Among 154 mother-baby dyads (CG, n=50; SG1, n=46; SG2, n=58), the percentage of breast milk delivery to NICU was 100%, 79% for CG, SG2, respectively (p<0.001). The EB rate between discharge and 30th day of life did not change between groups (CG:90%, SG1:89%, SG2:75.9; p=0.075).

Conclusions: If the mothers are informed about the importance of breast milk, the EB rates are not affected by the COVID-19 pandemic in short term, even if the mothers are obligatorily separated from their babies. The breast

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Emre Dincer, Nilgun Karadag, Sevilay Topcuoglu and Guner Karatekin, Department of Neonatology, University of Health Sciences, Zeynep Kamil Maternity and Children's Training and Research Hospital, Istanbul, Turkey milk intake rate of the babies was lowest while our NICU protocol was uncertain, and after we prepared a protocol this rate increased.

Keywords: breastfeeding; COVID-19; neonatal intensive care.

Introduction

The recent COVID-19 pandemic has spread all over the world with heavy consequences on public health and economics. In Turkey, the first COVID-19 case was detected on 11 March 2020 and until now; the number of cases has not reduced to the desired level. Among other clinical and public health issues, a major concern raised by COVID-19 is the possibility of transmission of the infection from mother to child in the perinatal period. Particularly, the option of the joint management of COVID-19 positive or suspected mothers and their children after birth and the safety of breastfeeding are still being questioned [1-6]. Although there were different recommendations in different parts of the world, the Chinese expert consensus suggested that infants should not be breastfed from mothers with confirmed or suspected COVID-19 until the mothers and their breast milk tests are negative for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [7].

Undoubtedly, breastfeeding provides beneficial health outcome for infants and their mothers, and also implies benefits for families as it has positive social and economic impacts [1, 4]. World Health Organization and United Nations International Children's Emergency Fund recommend early initiation of breastfeeding within 1 h of birth, exclusive breastfeeding (EB) for the first 6 months of life, and introduction of nutritionally-adequate and safe complementary foods at 6 months together with continued breastfeeding up to 2 years of age or beyond. Although the reports of the existence of SARS-CoV-2 in breast milk from COVID-19 puerperal patients highlight the risk of virus transmission through breastfeeding, the breast milk has not yet been shown to be a transmission vehicle [8-12]. On the other hand, based on the current scientific knowledge, recommendations for breastfeeding during the pandemic differ from country to country [1, 4, 8–12]. This uncertainty forces the clinicians to inform the parents about the possible

transmission ways of this new fatal virus through breast milk and to want them to choose the mode of infant feeding during their neonatal intensive care unit (NICU) stay.

Besides the COVID-19 positive and suspected mothers' babies, the admissions to NICUs are ongoing for other reasons during the pandemic, and there are many handicaps, such as home quarantine, fear of the COVID-19 transmission, and restrictions to parents' visits to NICU, that might impair the breastfeeding rates among hospitalized infants. In this study, we primarily aimed to find out if the expressed breast milk delivery rate to NICU of parents whose babies were hospitalized for any reason other than COVID-19 decreased during COVID-19 pandemic and was affected by the presence of a NICU protocol. The second aim of this study was to evaluate if EB rate between discharge date and 30th day of life of those babies decreased during COVID-19 pandemic and was affected by the presence of a NICU protocol.

Materials and methods

Study design

This was a retrospective cross-sectional study conducted in June 2020 at a Baby-Friendly Maternity and Children's Training and Research Hospital [13]. Local Ethics Committee approval was obtained for the study from the Ethics Committee (date: 24.06.2020, number: 113).

NICU protocol before the pandemic

Before the pandemic, as a NICU meeting the "Baby Friendly" criteria, all the mothers were allowed to visit and encouraged to feed their babies throughout the day. The importance of breastmilk was explained to the parents on admission and also repeatedly during the hospitalization period. Mothers were taught how to express milk by lactation nurses if direct breastfeeding is not possible. The expressed milk is stored according to Centers for Disease Control and Prevention recommendations and warmed at the feeding times [14].

NICU protocol during the pandemic

Between 11th of March and 31st of May, parents were allowed to visit their babies at NICU only once, on admission, to protect both the other babies and healthcare workers. All parents must wear masks, gloves, disposable clothing, and social distancing practices are adopted. The physicians and nurses wear surgical masks, wash their hands frequently, and use hand sanitizers containing at least 70% alcohol solutions before and after any contact with the baby. The babies born from mothers who were positive or suspected for COVID-19 are kept isolated in a dedicated area of the NICU ("quarantine zone"), where parents are not allowed, and physician and nurses have to wear personal protective equipment according to Centers for Disease Control and Prevention (CDC) guidelines (i.e., N95 respirators, gloves, eye

protection, and gowns). We did not routinely test the babies for COVID-19, if there was no contact history of COVID-19.

Between 11th of March and 11th of April 2020, because of the insufficient data about the transmission of SARS-CoV2 with breast milk, all parents were asked to express the breast milk, not to bring it to NICU and advised to store it to be used after discharge or after transition with breast milk is excluded. At the same time, this decision was also intended to prevent parents from using public transportation as well as crowding the NICU.

On 11th of April, 2020, in the light of the current literature, an informed consent form was prepared about the options of feeding modes during COVID-19 pandemic according to the Turkish Neonatal Society proposal, and this informed consent has been used in our NICU since then [15]. On admission to NICU, the parents are informed that COVID-19 infected patients could be asymptomatic, and those asymptomatic patients could be the carriers of the virus, so even if they did not have any symptoms of infection they might transfer the virus to their babies. Also, information were given about the possible transmission ways of this virus, that the virus had not been isolated from the breast milk yet, but a horizontal transmission was possible even in the neonatal period (we changed the informed consent form after we finished this study, as the COVID-19 was isolated from breast milk after this study ended). Lastly, the parents were asked to decide whether they will bring us expressed breast milk or they want us to use formula to feed their babies. If the parents decided to feed their baby with breast milk, the hygiene rules were carefully explained, as the mother should clean the breast pump tubing and container after each use and preferably have a dedicated breast pump and strict hand hygiene must be followed. Even if the parents decided us to feed their baby with formula during NICU stay, the mothers were all asked to express their milk and put the milk into the freezer to use it after discharge of their babies from NICU. The parents were called at least three times a week to give information about the health status of their babies and, if requested, videos of the babies were sent via mobile application during COVID-19 pandemic. Timeline of NICU protocol changes were presented in Figure 1.

Study population

We included the asymptomatic parents whose babies were hospitalized after 11th of March (the date the first coronavirus case was detected in our country) as the study group. Neonates who were hospitalized and discharged before 11 March 2020 were included as the control group (CG) and they were matched to study group individuals through gestational week, birth weight and length of hospital stay.

In the earlier period of the pandemic, it was difficult for us to guide the parents about breastfeeding, as we were also confused because of the inconclusive data about the management of the NICU during the pandemic. Between 11th of March and 11th of April, the mothers were asked to express their milk by following the hygiene rules and put the expressed breast milk into the freezer to use after discharge. After 11th of April the options for feeding their babies were offered and parents were allowed to bring expressed breast milk to NICU if they wished. So, neonates who were hospitalized for more than 7 and less then 15 days for any reasons other than COVID-19 in these two periods of different recommendations made up the two study groups. "Study Group 1 (SG1)" consisted of the mothers whose babies

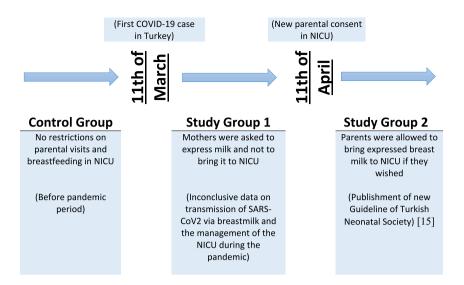


Figure 1: Timeline of changes of parental visit and breastfeeding protocols in our neonatal intensive care unit during COVID-19 pandemic. NICU: neonatal intensive care unit, SARS-CoV2: severe acute respiratory syndrome coronavirus 2.

were hospitalized between 11th of March and 11th of April, and "Study Group 2 (SG2)" consisted of the mothers whose babies were hospitalized after 11th of April (the date we started to use the informed consent form for feeding options in our NICU). Mothers and/or babies who had a medical factor that could significantly interfere with breastfeeding, and any symptoms of infection were excluded from the study.

The mothers were called by telephone to learn the EB rates at the end of the first month. They were also asked how many days they were able to bring expressed breast milk to NICU during their babies' hospitalization period, and whether they could bring expressed breast milk daily or not. In the presence of negative situations, the reasons were also asked. The number of days that breast milk was brought to the NICU was divided to the length of hospitalization, and then multiplied by 100, and the rate of breast milk delivery to the babies was calculated as percentages to standardize the mother milk availability days. Breast milk delivery percentages were compared between groups. Data were collected for the following variables: maternal age, gravida, parity, health status of mother-baby dyads during pregnancy, and contact number. For the newborns birth weight, gestational week, and the diagnosis on admission were recorded.

Lactation and breast milk support policy of our NICU

In our hospital, lactation education starts during pregnancy and as soon as the mothers give birth, our lactation nurses start supporting them to initiate and establish breastfeeding. If a baby is admitted to NICU, as soon as admission, the lactation nurses contact and support the mother to provide enough milk for the baby either by direct breastfeeding or expressing her milk if direct breastfeeding is not possible. Mothers are well and frequently informed about the importance of breast milk by both the nurses and the doctors. This education and support continue until the mothers are capable of breastfeeding their babies successfully. During the pandemic, lactation education continued via telephone calls.

Statistical analysis

The Statistical Package for Social Sciences version 21.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses. The normality was assessed using descriptive statistics and Kolmogorov Smirnov test. Categorical variables were expressed as frequency and percentage. Normally distributed continuous variables were expressed as mean ± standard deviation (SD) and non-normally distributed variables as median (interquartile range [IQR] p25-p75). Chi-square test was performed for categorical variables. The one-way analysis of variance (ANOVA) or Kruskal Wallis test was used for analysis of continuous variables. Post hoc tests were used for pairwise comparisons. A p-value < 0.05 was accepted for statistical significance.

Results

During the study period, 172 mother- baby dyads were eligible for enrollment, 18 of them were excluded because the mothers could not be reached by telephone, and 154 mother- baby dyads were analyzed. Diagnoses of the neonates at admission to NICU were given at Table 1. All of the

Table 1: Diagnoses of the neonates on admission to neonatal intensive care unit (n=154).

	n, %
Early onset neonatal sepsis	28 (18.2)
Congenital pneumonia	39 (25.3)
Transient tachypnea of newborn	37 (24)
Polycythemia, jaundice	38 (24.7)
Hypoxic ischemia encephalopathy	3 (1.9)
Prematurity, feeding intolerance, hypoglycemia	7 (4.6)
Congenital heart disease	2 (1.3)

Table 2: Comparisons of antenatal, demographical and clinical findings and breastfeeding outcomes by groups.

	Before 11 March (CG, n=50)	Between 11 March-11 April (SG1, n=46)	After 11 April (SG2, n=58)	p-Value
Maternal age, years, median (IQR)	29 (26-34)	27 (24–33)	30 (25–35)	0.478 ^a
Preeclampsia, n (%)	7 (14)	5 (10.9)	5 (8.6)	0.673 ^b
Early rupture of membranes, n (%)	7 (14)	5 (10.9)	6 (10.3)	0.823 ^b
Cesarean delivery, n (%)	22 (44)	16 (34.8)	23 (39.7)	0.653 ^b
Birth sequence, median (IQR)	2 (1-3)	2 (1–3)	3 (1-4)	0.095 ^a
Gestational week, median (IQR)	38 (36-39)	38 (36–40)	38 (35-39)	0.708^{a}
Sex (female), n (%)	27 (54)	22 (47.8)	24 (41.4)	0.423 ^b
Birth weight, g, mean \pm SD	3131 ± 593	2926 ± 649	3081 ± 676	0.269 ^c
Length of hospital stay, day, median (IQR)	9 (7-12)	10 (8–11)	10 (7-12)	0.784 ^a
Breast milk delivery to NICU, %, median (IQR)	100 (100-100)	0 (0-0)	79 (0-100)	<0.001 ^{a,d}
EB rates between discharge date and 30th day of life, n (%)	45 (90)	41 (89.1)	44 (75.9)	0.075 ^b

EB, exclusive breastfeeding; IQR, interquartile range; NICU, neonatal intensive care unit; SD, standard deviation. aKruskal Wallis test, ^bChi-square test, ^cOne-Way ANOVA test. ^dAll groups are different.

mothers who did not bring breast milk to NICU stated that they could not bring milk due to the COVID-19 even though they had expressed breast milk.

Maternal age, delivery mode, birth sequence, gestational week, gender, birth weight, and length of hospital stay were not found to differ between the three groups. Percentage of breast milk delivery to NICU was 100% (100-100) before the pandemic, and did not show significant difference between CG and SG2. Comparisons of antenatal, demographical and clinical findings and breastfeeding outcomes by groups were presented at Table 2.

Discussion

In our study, it was found that, even if the parents have no symptoms of COVID-19 infection, the parents' breast milk delivery to NICU rate was lower than it was before during the pandemic period, and the babies could not benefit from the effects of breast milk throughout NICU stay. On the other side, the EB rate between discharge date and 30th day of life was not found to be affected by COVID-19 pandemic. Even though the mothers were not allowed to see their babies in NICU during the pandemic, they could manage to express their milk during the hospitalization period and feed their babies adequately with only breast milk at the end of first month of life after discharge. Even in SG1, who did not receive any breastmilk during the hospitalization period, EB rates at the end of first month did not significantly differ from SG2 and CG of pre-pandemic era. Despite the pandemic and separation stress, the lactation policy of our NICU worked well, and it was obvious that babies could continue to be fed with breast milk even in these difficult periods with good education and support.

Human milk is the gold standard for infant feeding in neonates and infants [16]. In the current COVID-19 crisis, breastfeeding and the provision of human milk are recommended by most of the national and international organizations [15, 17-19]. It was found that SARS-CoV-2 may be present in human milk, and the data about role of human milk, and breastfeeding in vertical transmission of COVID-19 from mothers to infants are also conflicting [8-11]. Even the mothers with suspected or confirmed COVID-19, separation of the babies from the mothers is controversial for many reasons. It was emphasized that separation does not prevent infection, may cause stress in mothers, interferes with provision of maternal milk to the infant, may disrupt innate and specific immune protection and interruption of skin-to-skin care disrupts newborn physiology. Early separation disrupts breastfeeding, and not breastfeeding increases the risk of infant hospitalization for pneumonia [20, 21]. For now, it is known that protecting breastfeeding and breast milk is the best [19]. In the light of the literature, routine separation of the babies from the mothers is not a preferable way to prevent viral spread, but we could not find any data that researched the effects of obligatory separations of mother-baby dyads on breastfeeding outcomes.

To our knowledge, this is the first study that evaluated the effects of COVID-19 pandemic on breastfeeding outcomes among the neonates who were hospitalized for any reason other than COVID-19. We speculated that this virus might have long term adverse outcomes, as it could reduce the EB rates, but fortunately when the pre-pandemic period

and the pandemic period were compared, the EB rate between the day the babies were discharged and the 30th day of life were similar. The breast milk intake rate of the babies who were admitted to NICU was lowest while our NICU protocol was uncertain during the pandemic, and after we prepared a protocol this rate increased gradually during NICU stay. It is obvious that health care protocols and warnings are more effective than the pandemic on breast milk intake rates of the babies. It is also thought that, in order to avoid extra stress on the parents, parents can be informed that even though there is a lack of opportunity to bring breast milk to NICU, there is a high chance to provide the continuity of breastfeeding if the breast milk is expressed regularly.

Our study has some methodological limitations. Firstly, the retrospective design of the study did not allow us to evaluate the future effects of the pandemic on EB rates beyond the first month of life. Secondly, the length of hospitalization of the neonates in this study was limited to 14 days; therefore it might be thought that if the length of hospitalization was longer, the EB rates could be more severely affected by this separation period.

Conclusions

In conclusion, we showed that if the mothers are well informed about the importance of breast milk, transmission ways of the COVID-19, and hygiene rules while expressing their milk, the EB rates would not be affected by the COVID-19 pandemic in the short term, even if the mothers are obligatorily separated from their babies. Human milk is indisputably the best nutrition vehicle to reduce newborn morbidity and mortality during and beyond the pandemic. During the difficult days of COVID-19 pandemic, now is the time to inform the parents for the countless benefits of human milk, to educate and to support the mothers to express their milk to protect the future generation through maintaining post discharge breastfeeding.

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Competing interests: Authors state no conflict of interest. **Informed consent:** Informed consent was obtained from all individuals included in this study.

Ethical approval: Research involving human subjects complied with all relevant national regulations, institutional policies and is in accordance with the tenets of the Helsinki Declaration (as revised in 2013),

and has been approved by the authors' Institutional Review Board (date:24.06.2020, number: 113).

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