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Original Research

The Exclusively Breastfeeding Rate and Related Factors Among Preterm Infants at Discharge and Postnatal 6th Months of Age

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Abstract

Objectives: Breastfeeding is accepted to be the optimum nutrition for term and preterm newborns. The objective of our study was to investigate the rates of exclusive breastfeeding (EBF) at discharge among infants less than 34 weeks of gestation (GWs), followed up in neonatal intensive care unit (NICU) and to analyze the factors influencing EBF practices at discharge and 6th months of age.

Methods: In this study, we retrospectively evaluated the medical records of neonates <34 GWs admitted to NICU within the first postnatal 24 hours of life between January 2022 and June 2023. The maternal and neonatal demographic data and the related medical and nutritional factors, morbidities were recorded. Data regarding the duration of exclusive breastfeeding, and the maintenance of breastfeeding were retrieved from the follow-up records of the high-risk newborn outpatient clinic post-discharge. The rate of breastfeeding at discharge and the factors influencing breastfeeding practices were analyzed.

Results: The study cohort comprised 114 neonates, of whom 44.8% were female and 55.2% were male. The mean gestational age was 29.8±2.6 weeks and the mean birth weight was 1365±474 grams. The exclusive breastfeeding rate was 57.8% at discharge and declined to 45.6% at six months. The mean duration of breastfeeding was 15.7±6.5 months. Maternal ethnicity and the language barrier were found to be statistically significantly associated with exclusive breastfeeding at discharge, respectively (p=0.04, p=0.05). Infants who were exclusively breastfed at six months had significantly higher gestational age and shorter duration of hospital stay, respectively (p=0.029, p=0.02). Exclusive breastfeeding at six months was statistically significantly associated with a reduced incidence of extrauterine growth retardation (EUGR) (p=0.04). Among exclusively breastfed infants at discharge, 96.9% (n=64) received breast milk as their first feed, significantly more than mixed-fed infants (p=0.005). Time to reach full enteral feeding was also statistically significantly shorter in the exclusively breastfed group (p=0.017). Infants with a shorter duration of feeding via orogastric/nasogastric tube had a significantly higher rate of exclusive breastfeeding at six months compared to the mixed-fed group (p=0.043).

Conclusion: To improve exclusive breastfeeding rates at discharge and six months postnatally, and to reduce the incidence of EUGR, feeding preterm infants with their mother's own milk from birth should be actively promoted. In addition, comprehensive and consistent maternal support should be provided in the NICU to facilitate both the initiation and continuation of breastfeeding under all circumstances from birth.

Keywords: Discharge, exclusively breastfeeding, extrauterine growth retardation, preterm

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Breastfeeding represents the gold standard mode of nutrition during the neonatal period and the initial six months of life, optimizing infant growth and development. Human milk exhibits easy digestibility, high bioavailability, and encompasses all essential nutrients required by the infant. Furthermore, the bioactive components and beneficial microorganisms in human milk confer protection against infections, rendering it an ideal and infant-specific nutritional source. Beyond its fundamental role in healthy infant nutrition, human milk is also the most efficacious dietary intervention, with established benefits for both term and preterm infants receiving care and treatment within the neonatal intensive care unit (NICU).[1-4] Notably, breastfeeding infants admitted to the NICU holds critical significance due to its association with reduced mortality and morbidity rates, the prevention of illness and readmission within the first year of life, and the promotion of improved long-term neurodevelopmental outcomes.

The initiation of breastfeeding and the maintenance of exclusive breastfeeding (EBF) are influenced by a multitude of maternal and infant-related factors. The immediate postpartum hours are of paramount importance for the commencement and continuation of breastfeeding. This is particularly challenging and significant for extremely preterm infants in the intensive care setting who are confronted with many morbidities affecting multi-organ systems. Admission to the NICU, delayed mother-infant contact, and the physical and emotional adversities experienced by the mother throughout gestation can exert a negative impact on maternal-infant interaction and breastfeeding practices.[5-7] In this context, the expression of breast milk and the provision of optimal lactation support to the mother are crucial for enabling preterm infants to receive their mother's own milk.

The objective of our study was to investigate the rates of EBF at discharge among preterm infants followed up in NICU, to analyze the factors influencing breastfeeding practices.

Methods

This study was conducted retrospectively and included neonates who were admitted to the neonatal intensive care unit (NICU) of our hospital within the first 24 hours of life, between January 2022 and June 2023. "Ethics committee approval was obtained from the Istanbul Training and Research Hospital Clinical Research Ethics Committee (25.02.2025 Decree no: 30). Infants admitted within the first 24 hours who subsequently required inter-hospital transfer for any reason, those diagnosed with congenital metabolic disorders, neonates with congenital gastrointestinal system anomalies, and patients with incomplete data were excluded from the analysis. Maternal variables assessed included age, parity, presence of chronic medical conditions, medical complications encountered during pregnancy, prior hospitalizations during gestation, mode of delivery, language barriers, and challenges in access to healthcare. Neonatal variables included gestational age, birth weight, head circumference, the requirement for resuscitation in the delivery room, APGAR scores, primary diagnosis for NICU admission, the presence and duration of respiratory support, morbidities encountered during the NICU stay, time to initiation of enteral feeding, initial feeding modality, day of achievement of full enteral feeding, duration of orogastric or nasogastric tube feeding, type of feeding at discharge, length of hospital stay, weight and head circumference at discharge. Data regarding the duration of EBF, and the continuation of breastfeeding were retrieved from the follow-up records of the high-risk newborn outpatient clinic post-discharge. The rate of EBF at discharge and postnatal 6 months, and the factors influencing breastfeeding practices were analyzed.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY). Descriptive statistics, including means, standard deviations, medians, interquartile ranges, frequencies, percentages, minimums, and maximums, were utilized to summarize the study data. The normality of continuous variables was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Normally distributed continuous variables were presented as Mean±Standard Deviation, while non-normally distributed continuous variables were expressed as Median [minimum-maximum] or Median [Interquartile Range]. For comparisons between two groups of normally distributed continuous variables, the Independent Samples T-test was employed. The Mann-Whitney U test was used for comparisons of two groups of non-normally distributed continuous variables. Categorical variables were compared using the Chi-Square test or Fisher's Exact Test, as appropriate. Statistical significance was defined as a p-value <0.05.

Results

The study cohort comprised 114 neonates, of whom 44.8% were female and 55.2% were male. Sixteen infants were excluded from the study due to incomplete data. The gestational age of the participants ranged from 23 to 34 weeks, with a mean gestational age of 29.8±2.6 weeks. The mean birth weight was 1365±474 grams. The mean maternal age was 28.8±5.2 years. The median of maternal parity was 2 (min-max: 1-7). A total of 36.8% (n=42) of the infants were delivered vaginally, while 63.2% (n=72) were delivered via cesarean section. The mean duration of NICU stay was 50.9±32.9 days. The mean discharge weight was 2397±486 grams (Table 1).

Table 1. Demographic data of study population

Maternal characteristics	
Age*	28.9±4.8
Gravida [median (min.-max.)]	1 (1-4)
Parity [median (min.-max.)]	2 (1-7)
Route of delivery	
NSVD n (%)	42 (36.8)
C/S n (%)	72 (63.2)
Ethnicity	
Turkish, n (%)	87 (76.3)
Other, n (%)	27 (23.7)
Hospitalization during pregnancy, n (%)	58 (50.9)
Language barrier, n (%)	12 (10.5)
Limited access to the healtcare, n (%)	31 (27.2)
Neonatal characteristics	
Gender	
Female n(%)	51(44.7)
Male n(%)	63 (55.3)
Gestational week*	29.8±2.6
Birth weight(grams)*	1365±474
Weight at discharge*	2397±486
Lenght of hospital stay (day)*	50.9±32.9

NSVD: normal spontaneous vaginal delivery; C/S. C-Section. *(mean±SD).

The rate of EBF at the time of discharge was 57.8%, and the rate of EBF at six months of age was 45.6%. The mean duration of breastfeeding was 15±6.5 months.

Maternal factors influencing EBF at discharge and six months are detailed in Table 2. Maternal ethnicity and the language barrier were found to be statistically significantly associated with EBF at discharge, respectively (p=0.04, p=0.05).

Evaluation of infant-related factors and morbidities affecting EBF at discharge did not reveal any statistically significant differences (Table 3). However, infants who were exclusively breastfed at six months demonstrated a statistically significantly higher gestational age at birth, shorter duration of hospital stay, and younger post-conceptual age at discharge compared to infants receiving mixed feeding, respectively (p=0.029, p=0.02, p=0.046). Although not statistically significant, the duration of invasive mechanical ventilation during the NICU stay was lower in the six-month exclusively breastfed group compared to the mixed-feeding group. The length of hospital stay was significantly shorter in the six-month exclusively breastfed group (p=0.043). Among the 52 infants exclusively breastfed at six months, 13 (25%) were diagnosed with EUGR, whereas 27 (43.8%) of the 62 infants not exclusively breastfed at six months received a diagnosis of EUGR. EBF at six months was statistically significantly associated with a reduced incidence of EUGR (p=0.04) (Table 3).

The median time of initiation of the first feeding in the NICU was 2 days (min–max: 1-21). The majority of infants, 91.2% (n=104), received breast milk as their initial feed. Among exclusively breastfed infants at discharge, 96.9% (n=64) re-

Table 2. Maternal factors affecting feeding at discharge and postnatal six months

Maternal factors	**NICU Discharge**			**Postnatal 6th month**		
	Exclusively breastfed n=66 (%57.8)	**Mixed feeding n=48 (%42.2)**	**p**	**Exclusively breastfed n=52 (%45.6)**	**Mixed feeding n=62 (%54.4)**	**P**
Maternal age*	28.1± 4.8	29.9±4.6	0.670	28.1± 5.1	29.5±4.5	0.603
Gravida*	2.0±1.3	1.9±1.2	0.702	2±1.3	1.98±1.1	0.550
Parity*	1.5±0.8	1.6±0.8	0.654	1.6±0.8	1.6±0.8	0.925
Route of delivery**						
NSVD	23(34.8)	19(39.5)	0.606	17(32.6)	25(40.3)	0.748
C/S	43(65.2)	29(60.5)		35(67.4)	37(59.6)	
Maternal ethnicity**						
Turkish	46(69.6)	41(85.4)	0.047	39(44.8)	48(55.2)	0.763
Other	20(30.4)	7(14.6)		13(48.1)	14(51.9)	
Language barrier**						
Present	10(15.1)	2(4.2)	0.050	6(11.5)	6(9.7)	0.748
Not present	56(84.9)	46(95.8)		46(88.5)	56(90.3)	
Hospitalization during pregnancy	3.4±4.6	3.7±4.3	0.952	3.2±4.6	3.8±4.4	0.850
Limited access to the healtcare **	23(34.8)	10(20.8)	0.195	17(32.7)	16(25.8)	0.718

NICU: neonatal intensive care; NSVD: normal spontaneous vaginal delivery; C/S: C-Section. *mean±SD; ** n (%); Statistically significant p<0.05 values are in bold.

Table 3. Neonatal factors affecting exclusive feeding at discharge and postnatal six months

Neonatal factors	NICU Discharge			Postnatal 6th month		
	Exclusively breastfed n=66 (%57.8)	Mixed feeding n=48 (%42.2)	p	Exclusively breastfed n=52 (%45.6)	Mixed feeding n=62 (%54.4)	p
Gender, n (%)						
Female	28 (42.4)	23 (47.9)	0.562	20 (38.4)	31 (50)	0.219
Male	38 (57.6)	25 (52.1)		32 (61.6)	31 (50)	
Gestational week**	29.6±2.6	30.0±2.7	0.617	29.9±2.4	29.7±2.9	0.029
Birth weight**	1365±467	1366±488	0.576	1418±463	1321±481	0.499
Weight at discharge**	2430±481	2351±495	0.951	2385±423	2407±537	0.110
Hospital stay (day)**	50.1±29.5	52.2±37.5	0.360	45.5±24.9	55.5±38.1	0.028
Ventilation duration (days)**						
Invasive	10.6±16.1	10.8±17.6	0.163	8.2±14.3	12.7±18.4	0.079
Non-invasive	12.8±11.3	14.2±13.9	0.896	13.7±12.1	13.1±12.8	0.984
Total	23.3±23.1	24.9±29.3	0.522	21.8±21.9	25.9±28.6	0.248
Respiratory distress syndrome*	54 (81.8)	39 (81.2)	0.939	44 (84.6)	49 (79)	0.446
Chronic lung Disease*	16 (24.2)	11 (22.9)	0.870	13 (25)	14 (22.6)	0.763
hs-Patent ductus arteriosus*	19 (28.7)	10 (20.8)	0.269	12 (23.1)	17 (27.5)	0.787
Necrotizing enterocolitis *						
Stage 2-3	11 (16.7)	6 (12.5)	0.539	15 (28.8)	28 (45.2)	0.055
Intraventricular hemorrhage*						
Stage 1-2	15 (22.7)	7 (14.5)	0.378	12 (23)	10 (16)	0.605
Stage 3- PVHI	2 (3)	2 (4)		1 (2)	3 (5)	
Retinopathy of prematurity*						
Stage 2-3	5 (7.5)	3 (6.2)	0.263	3 (5.8)	5 (8.1)	0.263
Extrauterine growth retardation						
Present	21 (31.8)	19 (39.6)	0.393	13 (25)	27 (43.6)	0.040
Not present	45 (68.2)	29 (60.4)		39 (75)	35 (56.4)	

NICU: neonatal intensive care; Hs: hemodynamically significant; PVHI: periventricular hemorrhagic infarct; *n (%); **mean±SD; Statistically significant p<0.05 values are in bold.

ceived breast milk as their first feed, which was significantly higher (p=0.005). Time to reach full enteral feeding was also statistically significantly shorter in the exclusively breastfed group (p=0.017). Infants with a shorter duration of feeding via orogastric/nasogastric tube had a significantly higher rate of exclusive breastfeeding at six months compared to the mixed-fed group (p=0.043) (Table 4).

Discussion

Our study revealed an EBF rate of 57.8% and 45.6% at the time of discharge from the NICU and six months of age for infants born <34 GWs, respectively. The duration of invasive mechanical ventilation, the length of hospital stay, the duration of feeding via orogastric tube, and language barrier were identified as factors influencing exclusive breastfeeding rates at six months of age. Furthermore, EUGR was observed less frequently in infants exclusively breastfed at postnatal six months.

Kutar et al.,[8] reported an EBF rate of 30% at discharge among preterm infants born <34 GWs.[8] In our study, we found a higher EBF rate of 57.8% at NICU discharge among infants born before <34 GWs. We suppose that this higher rate may be attributed to optimum lactation support provided by a dedicated nurse, the initiation of enteral feeding as early as possible, the active promotion of breastfeeding, and the timely establishment of mother-infant skin-to-skin contact. In the same study, the rates of EBF at discharge were 12.5%, 14%, and 44.8% for moderate, very preterm and extremely preterm infants, respectively. These rates were lower than those reported for preterm infants from Sweden (55%, 41%, and 64%) but comparable to findings reported from Brazil.[9, 10] Similar to latter studies, we found that the exclusive breastfeeding rates at discharge for moderate, very preterm, and extremely preterm infants were 50.0%, 64.4%, and 55.0%, respectively.

Table 4. Feeding characteristics at discharge and postnatal six months

Feeding characteristics	NICU discharge			Postnatal 6th month		
	Exclusively breastfed	Mixed feeding	p	Exclusively breastfed	Mixed feeding	p
Inititation of feeding(days)	2.2±3.5	2.3±1.9	0.88[a]	2.5±1.4	2.4±1.1	0.998[a]
Type of first feeding						
Breast milk	64 (%96.9)	40 (%83.3)	0.005[b]	49 (%94.2)	54 (%87)	0.201[b]
Formula	2 (%4.1)	8 (%16.7)		3 (%5.8)	8 (%13)	
Time of transition to FEF	19.2±11.0	25.3±19.4	0.017[a]	18.8±11.4	24.4±17.7	0.068[a]
Duration of feeding with NGT/OGT	36.8±20.9	39.1±30.4	0.183[a]	34.4±19.8	40.6±28.9	0.047[a]

NICU: neonatal intensive care; FEF: Full enteral feeding; NGT: Nasogastric tube; OGT: Orogastric tube; [a]Mann-Whitney U test; [b]chi-square test; Statistically significant p < 0.05 values are in bold.

In their study, Wang Y et al.[11] reported that only 22.5% of preterm infants were exclusively breastfed at six months, highlighting the challenges in breastfeeding initiation and continuation. Similarly, Sokou et al.[12] found that while 78.1% of NICU-discharged preterm infants initially received human milk, the exclusive breastfeeding rate at six months dropped to 19.4%. In contrast, we found a higher EBF rate of 45.6% at postnatal six months. This may be related to close post-discharge follow-up extending to two years for infants born <34 GWs, along with maternal education and breastfeeding support. Our cohort's exclusive breastfeeding rate at discharge was 57.8%, decreasing to 45.6% by six months. Among extremely preterm infants, this decline was more pronounced (58% to 34.6%). This reduction may be associated with prolonged hospitalization, delayed transition to oral and full enteral feeds, and the psychological burden experienced by mothers during the NICU stay. Nevertheless, the relatively higher six-month EBF rate observed in our study compared to other reports may reflect the positive impact of structured support and follow-up services.

Prior research has indicated that factors impacting EBF in term infants include insufficient lactogenesis, maternal anxiety, and factors impeding effective sucking and swallowing.[13] These risks are reported to be more prevalent in the preterm population. Preterm neonates frequently experience challenges related to enteral nutrition due to the immaturity of their gastrointestinal systems.[14] Preterm human milk is recognized as the optimal nutritional source for these infants, offering immunological protection and containing digestive enzymes and nutrients specifically tailored to their developmental needs.[15, 16] Achieving full enteral feeding with mother's milk as early as feasible is a pivotal goal of preterm infant care, crucial for optimizing growth and neurodevelopmental outcomes.[17] In the study of Bagga et al.,[18] they suggested that breastfeeding at the initial feeding was associated with a 1.5-fold increase in the odds of EBF. The most likely explanation for this association is the presence of a critical early postpartum period during which establishing and maintaining adequate milk production is essential. Achieving sufficient milk volume in these days is key to support sustained breastfeeding over time.[19-21] Similarly, in our study, 91.2% of infants had received breast milk as their initial feed and we found a statistically significantly higher EBF rate at discharge among infants who received breast milk as their first feed.

Many factors may influence EBF outcomes of preterm infants at the time of NICU discharge and postnatal six months. In the study of Kutar et al.,[8] type of delivery, delay in initiating tube feeding and establishment of oral feeds were found to be associated with a shorter duration of EBF. Similarly, in another study, the type of delivery, gestational age, and maternal family support were observed to be independent predictors of EBF at postnatal six months.[22] In our study, at the time of discharge, there were no significant differences between the exclusively breastfed and mixed-fed groups in terms of mechanical ventilation duration, length of hospital stay, or duration of orogastric feeding. However, by 6 months of age, the length of hospital stay was significantly shorter in the EBF group.

Reddy et al.,[23] reported that mothers of exclusively breastfed infants were younger, with EBF rates being 5% higher among younger mothers. In developing countries, factors such as limited access to education and insufficient familial support for the mother may affect breastfeeding practices among young mothers. This observation contrasts with findings in high-income countries, where higher maternal age is often associated with better

breastfeeding experiences and an increased rate of EBF. These discrepancies emphasize the importance of considering socioeconomic variables when evaluating the impact of maternal age on breastfeeding outcomes.[24] In our study, we could not identify any significant association between maternal age and EBF.

Language and cultural barriers are important factors which may have a negative impact on the success of EBF.[18] Previous studies also indicate that language and cultural barriers can limit access to consistent lactation support.[25-28] While some research has shown reduced breastfeeding rates among mothers with different ethnicities, others have highlighted the positive impact of culturally tailored programs.[12, 29, 30] In our study, the mothers who experienced language barriers with the health care team were less likely to exclusively breastfeed their child at NICU discharge. These results suggest that effective communication and family support contribute to improved breastfeeding rates in the NICU settings and at discharge.

Compared to formula feeding, human milk feeding in preterm infants is well-established to reduce preterm morbidities.[31] In a study evaluating risk factors for EUGR in infants with very low birth weight, the cessation of feeding and a prolonged time to achieve full enteral feeds were identified as independent risk factors. It has been reported that the avoidance of delayed feeding in the postnatal period and the prompt advancement to enteral nutrition are crucial for the prevention of EUGR in preterm infants.[32] Risk factors associated with EUGR development in preterm infants were defined as moderate-severe chronic lung disease, delay in the transition to enteral feeding, and insufficient human milk intake.[33] Non-breastfed infants are at an increased risk of growth failure, underscoring the critical importance of breastfeeding in this population. Consistent with the existing literature, in our study, we observed a lower incidence of EUGR in preterm infants exclusively breastfed at six months. We emphasize that, transition to full enteral feeding as early as possible, supporting breastfeeding, increasing caloric intake in the first week, may improve weight gain velocity and prevent EUGR.

Conclusion

In conclusion, to improve exclusive breastfeeding rates at discharge and six months postnatally, and to reduce the incidence of EUGR, feeding preterm infants with their mother's own milk from birth should be actively promoted. In addition, comprehensive and consistent maternal support should be provided in the NICU to facilitate both the initiation and continuation of breastfeeding under all circumstances from birth.

Disclosures

Ethics Committee Approval: The study was approved by the Istanbul Training and Research Hospital Clinical Ethics Committee (date: 25.02.2025, no: 30).

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