Original Research Article

Barriers to mother's own milk feeding for preterm newborns experience from a tertiary neonatal intensive care unit

**Abstract**

**Introduction**

Mother’s own milk gives complete nutrition, immunity, and reduce mortality and morbidity in preterm newborns.Despite its numerous benefits provision of mother’s own milk for preterm babies is still not optimal in neonatal intensive care units

**Objectives**

To determine the challenges to mother's milk feeding for preterm newborns in the neonatal intensive care unit(NICU).

**Methods**

This cross-sectional study was conducted from March 2021 to July 2021 prior to a quality improvement study in the Department of Neonatology at Bangabandhu Sheikh Mujib Medical University in Dhaka. Mother and preterm baby dyads(≤34 weeks and/or ≤1800 gm) who were anticipated to remain in the NICU for at least seven days were included in this study. Mother and newborn demographics, maternal illness, breastfeeding counseling and demonstration, were evaluated in relation to the early expression and feeding of mother's own milk as well as on quantity of expressed breast milk.

**Results**

The study included 50 preterm newborn and mother dyads. Only 4% of mothers expressed breast milk within 6 hours of birth, and 18% on day one. The failure to express breast milk within 6 hours had a negative impact on the volume of breast milk on days 1 and 3. Similarly, lack of breast milk expression on day 1 and day 3 had a negative effect on the volume of breast milk on day 1 and day 3, respectively. Only 18% of newborns were fed on mothers own milk on day 1.Lack of expression on the first day had a deleterious effect on the early feeding of preterm babies.

**Conclusion**

Our study revealed several hurdles to mother's own milk feeding for preterm babies, including a lack of antenatal counseling, demonstration of breast milk expression, delayed and less frequent breast milk expression.Therefore the implementation of a quality improvement study with a comprehensive counseling package will be a time demanding approach to improving mother’s own milk feeding in the NICU.

**Keyword:** Mother’s own milk, Expressed breast milk, Low birth weight, Preterm neonate.

**Introduction**

The World Health Organization estimates that over 13 million babies are born prematurely every year, making up over 10% of all live births globally.[1]Mother’s own milk feeding is one of the five life-saving interventions for preterm care recommended by The International Federation of Gynecology and Obstetrics.[2]WHO strongly recommends early initiation of mother’s own milk(MOM)feeding for preterm or low birth weight (LBW) babies including very preterm(<32 wks) or veryLBW <1500g) newborns.Use of donor milk is recommended when mother’s own milk is unavailable.[3]

Among the 103 countries in the world, Bangladesh ranks first in the world for preterm birth, and this rate is 16.2%. Bangladesh holds the second position among 158 countries for LBW in 2020. Twenty-five thousand newborns die per year in Bangladesh from prematurity and LBW. [4]

Geographically, the frequency of late onset neonatal sepsis (LONS) among hospitalized newborns varies from 0.61 to 14.2%, whereas the incidence of necrotising enterocolitis is 2 - 7% among infants with gestational age <32 weeks and 5–22% among infants with birth weight <1000 g.[5,6] Both NEC and LONS are the major contributors to mortality rates as high as 20–30% and 13–19%, respectively, among preterm infants in neonatal intensive care units.[7,8]

Premature neonates face feeding challenges due to undeveloped GIT system, poor coordination when sucking and swallowing, and delayed feeding. This leads to nutritional failure, poor growth and development.

Sepsis and NEC are less common in premature babies who fed on their mother's milk.[9]A cohort study showing that the estimated intake of lactoferrin in mother's own milk was inversely associated with the composite outcome of LONS, NEC and death.[10]

In extremely preterm newborns, consuming more MOM rather than donor milk or formula led to better postnatal weight gain and head circumference and reduced incidence of Retinopathy of prematurity.[11]In the long term, mother’s own milk reduces the risk of Bronchopulmonary dysplasia and metabolic syndrome.[12.13]

A positive relationship was seen between the quantity of breast milk received during hospitalization and neurodevelopmental outcomes in premature infants.[14]

Mothers of neonates admitted to NICU face biological difficulties, stress related to NICU admission, and multiple challenges in establishing and maintaining an adequate supply of milk.[15,16]

Due to a lack of appropriate communication, counselling, and lactation assistance, there is a considerable delay and a decrease in the availability of mother's own milk.

The healthcare team faces a significant difficulty in overcoming this constraint. Several studies have identified maternal characteristics such as race/ethnicity, maternal age, education, marital status and other socio-economic factors that influence the provision of MOM. Major morbidities of the infant especially BPD are considered further risk factors for cessation of MOM feeding during the hospital stay[17]

Literature Review shows some modifiable and non modifiable factors affecting mother’s own milk feeding.Modifiable factors are lack of practicing of skin to skin care immediately after birth & in the first week of life[18-21]

A delay of the first breast-milk expression for more than 48 h postpartum is an important risk factor for non MOM feeding[22].The initiation of breastfeeding is hampered by a caesarean section in term newborns [23-25]

Although the rates of human milk use in NICU have improved during the last decade, efforts to help mothers express and maintain their own milk are still lacking in our country. Therefore the aim of this study was to evaluate the barriers to mother’s own milk for preterm newborns .

**Materials and Methods**

**Study design**

This cross sectional study was done in the Department of Neonatology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, from March 2021 to July 2021 prior to a quality improvement study after getting approval from the Institutional Review Board.

**Eligibility criteria**

Inborn Preterm neonates ≤34wks and/or ≤1800 gm and mother dyads, anticipated to stay in the NICU for more than 7 days were eligible for enrolment. Infants with haemodynamic instability, gross congenital anomalies, any surgical condition where there is a contraindication of breast milk, non - availability of mother’s own milk because of critically sick mother, postpartum psychosis, and mother on anti-cancer medication were excluded from the study.

**Data collection procedures**

A written informed consent was taken from parents.Demographic and socioeconomic information, mode of delivery, gestational age, birth weight, number of fetuses, maternal illness were collected.

Data related to mother’s milk like counseling related to the importance of mother's own milk for a preterm baby, demonstration & frequency of breast milk expression,percentage of mothers expressed their breast milk within 6hrs of birth, on day 1, 3 and 7; amount of expressed breast milk on day 1,3 and 7; percentage of newborn fed on only mother’s own milk in days 1,3 and 7 were collected.The amount and type of breast milk was documented in the breast milk expression chart by the principal investigator, other team members, and on-duty nurses. Shared breast milk was taken from the mothers who gave birth at term and most of the time it was transitional and mature milk. Parents kept the name and address of each other to prevent the marriage between “milk-siblings” (breastfed from the same mother) in the future.

Fish bone analysis(Fig.1) was done to identify the possible factors for less availability of mother’s own milk in the NICU. Lack of counseling and demonstration of breast milk expression, delayed and less frequent expression of breast milk, lack of privacy to express breast milk and separation of mother and baby after birth due to NICU admission were found to be important root causes for less availability of mother's own milk in NICU.

Pareto analysis(Fig.2) was done to find out most important factors among the number of root causes. Bar charts present the actual data in descending order. The line graph presents the percentage of cumulative data in ascending order. Lack of counseling on early expression of breast milk, lack of demonstration of breast milk expression, and delayed and less frequent expression of breast milk made an 82.7% contribution to lesser mother's own milk availability in NICU.

Data on outcome variables were collected. The effect of maternal and neonatal factors on early expression of breast milk, the effect of expression of breast milk on volume of breast milk, and the mother’s own milk feeding were observed and analysed.

**Data analysis**:

After collection, data were entered into a personal computer, analyzed, and plotted in tables. Data were analyzed using the Statistical Package for Social Sciences version 20. Quantitative data were expressed as mean± SD for normally distributed data and median & interquartile range for data with skewed distribution. Categorical data were presented as frequency and percentage. Quantitative variables were compared by independent sample t-test for normally distributed data and the Mann-Whitney U test was used for non-parametric data. Categorical variables were compared by the Chi-square and Fisher’s exact test. A multivariable regression analysis was performed to determine the impact of maternal and neonatal demographic parameters, as well as maternal morbidities, on breast milk expression effect of expression of breast milk on milk volume and newborn fed on mother’s own milk.P value <0.05 was considered as significant.

**PLACE**: 1. Mother and baby separated

2. Lack of privacy to express breast milk.

**POLICY**: No hospital policy for early expression of breast milk for preterm baby

Less availability of MOM for preterm baby in NICU.

**PROCEDURE:**

1. Lack of knowledge regarding procedure of expression

2. Lack of proper counseling protocol

**PEOPLE**:

1. Inadequate knowledge regarding the advantage of MOM among the mothers

2. Delayed expression of milk

3. Insufficient milk volume

4. Decreased frequency of breast milk expression

 **Figure 1: Fishbone analysis; MOM: Mother’s Own Milk**

 **Figure 2: Pareto analysis**

**Results**

A total of 65 preterm newborns having a gestational age of ≤ 34 weeks were enrolled in the study. Among the 65 newborns, 15 were excluded due to haemodynamic instability, gross congenital anomalies, and maternal critical condition during the study period. Ultimately, 50 neonates fulfilling the inclusion criteria and mother dyad were included in the study.

**Table 1: Baseline characteristics of maternal factors in studied group (N=50)**

|  |  |
| --- | --- |
| **Parameter** | **values (n=50)** |
| **Maternal age, n (%)** |  |
| <20 yrs | 0 |
| 20-30 yrs | 33(66) |
| 31-39 yrs | 17(34) |
| **Maternal education, n (%)** |  |
| Less than high school | 3(6) |
| High school  | 30(60) |
| Degree &above | 17(34) |
| **Parity, n (%)** |  |
| Primipara | 19(38) |
| Multipara | 31(62) |
| **No of antenatal visits, n (%)** |  |
| <4 | 4(8) |
| ≥ 4 | 46(92) |
| **PIH, n (%)**  | 18(36) |
| **Preeclampsia, n (%)** | 11(22) |
| **GDM, n (%)**  | 10(20) |
| **PPROM, n (%)**  | 18(36) |
|  |  |

Table 1 showing maternal demographic factors and morbidities. Most of the mothers were educated up to high school, multiparous and took ≥ 4 antenatal care.

**Table 2: Baseline characteristics of neonates in studied group (N=50)**

|  |  |
| --- | --- |
| **Parameter** | **Values n=50** |
| **Gestational age(weeks)****Mean ± SD** | 32.08 ± 1.94 |
| **Birth weight(gm)****Mean ± SD** | 1441.00±324.58 |
| **Fetal growth, n (%)** |  |
| SGA | 12 (24) |
| AGA | 38 (76) |
| **Gender of the baby, n (%)** |  |
| Male | 22 (44) |
| Female | 28 (56) |
| **Number of Gestation, n (%)** |  |
| Single | 42 (84) |
| Multiple | 8 (16) |
| **Mode of delivery, n (%)** |  |
| Vaginal delivery | 9 (18) |
| LUCS | 41 (82) |

The general characteristics of newborns are shown in Table 2. Mean gestational age was 32.08 ± 1.94 wks and birth weight was 1441.00.± 1324.58 gm. Most of the newborn’s weight was appropriate for gestational age and delivered by LUCS.

|  |
| --- |
|  |

**Table 3: Counseling and demonstration of breast milk expression, expression of breast milk within 6hrs of birth, day 1 day 3 and day 7** **in studied group (N=50)**

|  |  |
| --- | --- |
| Parameter | Values n=50 |
| Counseling on breast milk expression  | 2(4) |
| Demonstration of breast milk expression | 2(4) |
| Expression of breast milk within 6hrs of birth, n (%) | 2(4) |
| Expression of breast milk on day 1, n (%) | 9(18) |
| Expression of breast milk on day 3, n (%) | 48 (96) |
| Expression of breast milk on day 7, n (%) | 47 (94) |

|  |
| --- |
|  |

Table 3 shows only 4% of mothers got counseling, demonstration of breast milk expression and expressed their milk within 6 hrs of birth.Whereas breast milk expression rate on day 1, day 3, and day 7 was 18%, 96%, and 94%, respectively.

**Table 4:Effect of maternal and neonatal demographic factors and maternal morbidity on expression of breast milk on day 1**

|  |  |
| --- | --- |
|  | **Expression of breast milk on day 1** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Maternal age(21-30yrs) | 1.00 | 262.915 | 0.004 | 1.00ns |
| Maternal education  | 1.00 | 376.741 | 0.003 | 1.00ns |
| Parity  | 1.00 | 352.843 | 0.003 | 1.00ns |
| Mode of delivery | 1.00 | 1875.666 | 0.001 | 1.00ns |
| Multiple gestation | 1.00 | 1616.170 | 0.001 | 1.00ns |
| Gestational age | **1.00** | 6.176 | 0.162 | 1.00ns |
| Birth weight | **1.00** | 1.013 | 0.987 | 1.00ns |
| PIH | 1.00 | 4063.975 | 0.000 | 1.00ns |
| Pre eclampsia | 1.00 | 7399.489 | 0.000 | 1.00ns |
| GDM | 1.00 | 1339.235 | 0.001 | 1.00ns |
| PPROM | 1.00 | 890.717 | 0.001 | 1.00ns |

Table 4 shows no effect of maternal and neonatal demographic factors and maternal morbidity on expression of breast milk on day 1.

**Table5:Amount of expressed breast milk on day 1, day 3 and day 7 in studied group (N=50)**

|  |  |
| --- | --- |
| Parameter | Amount in ml Median (IQR) |
| Amount of expressed breast milk on day 1  | 0.00(0.00-0.00) |
| Amount of expressed breast milk on day 3  | 10.5 (7-10.5) |
| Amount of expressed breast milk on day 7 | 60 (50-102.75) |

Table 5 shows that the amount of expressed breast milk on day 1 was negligible in amounts and on day 3 & day 7 was 10.5 ml,and 60 ml on day 3 and day 7 respectively.

**Table6: Effects of expression of breast milk within 6hrs of birth , day 1 and 3 on amount of breast milk on day 1, 3 and 7 in studied group (N=50)**

|  |
| --- |
|  |
|  | **Amount of Breast milk on day 1** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk within 6hrs of birth | -3.143 | -1.219 | -5.067 | 0.002s |
| Expression breast milk on day 1 | -2.857 | -1.876 | -3.838 | <0.001s |
|  | **Amount of Breast milk on day 3** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk within 6hrs of birth | -81.643 | -10.382 | -152.904 | 0.026s |
| Expression breast milk on day 1 | -13.650 | 22.697 | -49.997 | 4.54ns |
|  | **Amount of Breast milk on day 7** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk within 6hrs of birth | -139.000 | 69.397 | -347.397 | 0.186ns |
| Expression breast milk on day 1 | -46.878 | 59.417 | -153.173 | 0.379ns |

Table 6 shows failure to express breast milk within 6 hours of birth had an negative impact on the volume of breast milk on days 1 and day 3. Lack of breast milk expression on day 1 had an negative effect on amount of breast milk on day 1 .

**Table7:Effects of expression of breast milk on day 3 on amount of Breast milk on day 3 and day 7 in studied group (N=50)**

|  |  |
| --- | --- |
|  | **Amount of Breast milk on day 3** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk on day 3 | 69.344 | 135.685 | 3.003 | 0.041s |
|  | **Amount of Breast milk on day 7** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk on day 3 | 180.083 | 367.685 | -6.892 | 0.059ns |

Table 7 shows that lack of breast milk expression on day 3 had an impact on amount of breast milk on day 3 but not on day 7.

**Table 8 :Newborns fed on only mother’s own milk in studied group (N=50)**

|  |  |
| --- | --- |
| Parameter |  Numbers (%) |
| Newborns fed on only mother’s own milk (MOM) on day 1 | 9 (18) |
| Newborns fed on only mother’s own milk (MOM) on day 3 | 45 (90) |
| Newborns fed on only mother’s own milk (MOM) on day 7  | 46 (92) |

Table 8 shows that only 18% of newborns fed on only MOM on day 1 whereas 90% and 92% fed on only MOM on day 3 and day7 respectively.

**Table 9 : Effects of expression of breast milk within 6hrs of birth , day 1 and 3 on newborns fed on mother's own milk on day 1, day 3 in studied group (N=50)**

|  |  |
| --- | --- |
|  | **Newborns fed on mother's own milk on day 1** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk within 6hrs of birth | 0.286 | 0.715 | -0.144 | 0.187ns |
| Expression breast milk on day 1 | 0.666 | 0.885 | -0.446 | <0.001s |
|  | **Newborns fed on mother's own milk on day 3** |
| **Parameter** | **OR** | **95% CI** | **P value** |
| **Upper** | **lower** |
| Expression breast milk within 6hrs of birth | 1.14 | 0.481 | -0.481 | 1.00ns |
| Expression breast milk on day 1 | 0.103 | 0.349 | -0.144 | 0.406ns |
| Expression breast milk on day 3 | 0.397 | 0.833 | -0.038 | 0.072ns |

 Table 9 shows that expression of breast milk on day one had an effect on early initiation mother’s own milk feeding which was statistically significant.

**Discussion**

This cross sectional study was done to find out the barriers to mother's own milk for preterm babies admitted to NICU, BSMMU over a period of five months. Similar studies on factors affecting MOM feeding have been published previously. They evaluate the effects of certain maternal and neonatal factors on MOM feeding at discharge. However in our study we gave emphasis to find out the factors affecting early expression & feeding of MOM, amount of breast milk on first 7 days after birth.

This study showed that expression of breast milk within 6 hrs has effects on the amount of breast milk on days 1 and 3. Expression of breast milk on day 1 and day 3 has an effect on the amount of milk on day 1 and day 3, respectively. Expression of breast milk within 6 hrs has no effect, but expression of breast milk on day 1 has an effect on newborn feeds of MOM on day 1.This reflects that mothers usually need lactational support during the first 3 days when the milk let-down reflex occurs. Mothers who fail to express milk within the first 3 days after birth, lactogenesis stage II will be delayed in their case, which will lead to a decreased amount of breast milk and compromised mother’s future milk production. In our study, We found the same results in our study.

In mothers with VLBW infants, the time to lactogenesis stage II is shortened and milk volume is increased when milk expression is started within one hour after birth.[26]

Research indicates that there was a favourable correlation between the early expression and commencement of enteral feeding and milk volume on days 7 and 14 and those on days 21, 28, 35, and 42. On days 7, 14, and 42, women who pumped more than six times per day produced more milk than mothers who pumped less than six times per day. [27] Effective and timely milk removal increases milk production; a successful lactation is established if enough milk is removed by the third postpartum day.[28]

Previous research has identified both modifiable and non-modifiable elements that contribute to MOM feeding among preterm newborns.[29]In our study, we found no effect of mother demographic variables or morbidities on the early expression and commencement of MOM feeding in preterm neonates.

 Our findings align with Heller N, et al's study, which found no correlation between maternal age, academic degree, or parity and rates of MOM feeding at discharge. However, some studies suggest that young maternal age may be a risk factor for non-MOM feeding at discharge. In preterm infants <34 weeks, each year of maternal age was related with a 1.24-fold increase in direct breastfeeding at hospital release. [30]

 Maternal socioeconomic status effects breast-milk feeding in both term and preterm babies.More mothers with lower educational levels discontinue nursing before discharge.[31]

Mode of delivery has a powerful impact on the feeding of newborns; specifically, after caesarean section, mothers of preterm babies remain in a stressful condition as most of the preterm babies are admitted to the NICU. Therefore, physical and mental agony and separation of mother and baby due to NICU admission ended up with less expression of breast milk and delay in initiation of first feeding. Delivery by LSCS, lack of breastfeeding awareness, and psychosocial difficulties significantly affected the ability of mothers to provide early MOM. [32] Similar studies from high-income countries have shown that caesarean section, maternal stress, and lack of lactation support impair mothers’ ability to provide MOM. [33-35] In our study, mode of delivery didn’t have an effect on mothers own milk supply. However, we observed that lack of awareness and counseling is one of the major barriers to MOM feeding in the NICU.

Gestational diabetes also was associated with fewer MOM feeds.[29] Systematic assessment and meta-analysis showed the main barriers to breastfeeding in preterm infants included low gestational age, lower maternal education, insufficient breast milk, multiple births, smoking, and single motherhood. [36] In our study we didn’t find any effect of gestational age or multiple births on MOM feeding, but less milk volume was associated with less MOM feeding.

The goal of this study was to find out the factors responsible for and/or affecting mother's own milk for the preterm babies. This study was done prior to a QI study to improve mother’s own milk feeding in the NICU and decrease the use of shared breast milk, which was most of the time term, mature breast milk and does not contain the same amount of nutrients and immune factors as that of premature breast milk. We found some root causes responsible for delayed milk expression and poor milk volume in mothers of preterm babies. Previous studies also found the same root causes, like lack of antenatal counselling & demonstration of breast milk expression, delayed (sometimes no milk up to the first 24-48 hrs), and less frequent (2-3 times a day) breast milk expression [37-39].

Evidence suggests that both healthcare professionals and peer support for mothers contribute to the success of breastfeeding in babies.[40, 41]Literature also proposes a positive effect of education and lactation support on maternal decisions to provide exclusive mother's own milk for very low birth weight infants. [42-44] First milk expression ≤ 6 hours after birth improved from an average of 24% before the Wee Pump” campaign to 41% afterward. [42] Most of the studies preferred 6 hours within birth for first breast milk expression because of more availability of mothers in a stable and awake state after delivery, as most of the babies are delivered prematurely by LUCS because of maternal complications. [30, 31] Mothers started to express breast milk within 3 hours of birth in a study done by Sethi et al. in 2017. [37]

In our study, only 18% of mothers expressed breast milk on day one. A QI study done by Sethi et al. showed that before intervention, 12.5% of mothers express breast milk on day 1. [37] In our study during the observation phase, 96% of mothers expressed breast milk on day 3. In a study on day three, 25% of mothers expressed breast milk in the observation phase whereas 100% of mothers expressed breast milk in the intervention phase. [37] This difference in the observation phase from their study is due to the use of formula milk in their unit. They were able to decrease the requirement of formula milk by almost 50% after the first week of the intervention phase.

In our study, the amount of expressed breast milk on day 1, day 3, and day 7 was low, similar to that of the observation phase of some studies. [37, 38] only 18% preterm fed on the mother's own milk on day in our study, which is consistent with the study done by Bagga et al. [38]. The proportion of neonates who received their mother's own milk within the first 24 hours improved from 24% in retrospective controls to 82.9% in the initiation phase. [45] In a study before the implementation of any comprehensive communication bundles, the percentage of VLBW neonates who received their mother's own milk as the first feed was 19%. [46]

Our study showed some barriers to mothers’ own milk feeding for preterm newborns and based on the results suggests that early initiation and continuation of breast milk expression might have a positive effect on the amount of breast milk and increasing MOM feeding for preterm newborns.

**Limitations**

1.We could have follow-up mother’s own milk feeding till discharge

2.We could have evaluated the effects of neonatal morbidities on MOM feeding

**Conclusion**

Our study revealed several hurdles to mother's own milk feeding for preterm babies, including a lack of antenatal counseling, demonstration of breast milk expression, delayed and less frequent breast milk expression.Therefore the implementation of a QI study with a comprehensive counseling package will be a time demanding approach to improving mother’s own milk feeding in the NICU.

**Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Ethical Approval:** As per international standards or university standard written ethical approval has been collected and preserved by the author

**References:**

1. 1 in 10 babies worldwide are born early, with major impacts on health and survival, 2023. Available at https://www.who.int/news/item/06-10-2023-1-in-10-babies-worldwide-are-born-early--with-major-impacts-on-health-and-survival

2. World Prematurity Day 2024: Championing quality care for every preterm newborn

Image, 2024.

Available at https://www.figo.org/news/world-prematurity-day-2024-championing-quality-care-every-preterm-newborn

3. WHO recommendations for care of the preterm or low-birth-weight infant, World Health Organizatiom, 2022.

Avaiable at https://apps.who.int/iris/bitstream/handle/10665/363697/9789240058262-eng.pdf

4. Bangladesh-records-highest-preterm-birthrate-among-103-countries1000956. Available at https://www.tbsnews.net/bangladesh/bangladesh-records-highest-preterm-birthrate-among-103-countries-1000956

5. Dong Y, Speer CP. Late-onset neonatal sepsis: recent developments. Arch Dis Child Fetal Neonatal Ed. 2015 May;100(3):F257-63. doi: 10.1136/archdischild-2014-306213.

6. Nathalie Lamireau, Eva Greiner, Jean-Michel Hascoët,Risk factors associated with necrotizing enterocolitis in preterm infants: A case–control study,Archives de Pédiatrie,Volume 30, Issue 7,2023,Pages 477-482

7. Sisk PM, Lovelady CA, Dillard RG, et al. Early human milk feeding is associated with a lower risk of necrotizing enterocolitis in very low birth weight infants. *J Perinatol*. 2007; 27(7):428–433.

8. Furman L, Taylor G, Minich N, Hack M.The effect of maternal milk on neonatal morbidity of very low-birth-weight infants*. Arch. Pediatr. Adolesc. Med*.2003;157:66–71.

9. [Houchi](file:///C%3A%5CUsers%5CUSER%5CDocuments%5Cmom%20effect%5C%3F_action%3Darticle%26au%3D541122%26_au%3DSalma%2BZ.%2BEl%2BHouchi) S, [Ismail](file:///C%3A%5CUsers%5CUSER%5CDocuments%5Cmom%20effect%5C%3F_action%3Darticle%26au%3D541123%26_au%3DShahenda%2BS.%2BIsmail) S, [Elmazzahy](file:///C%3A%5CUsers%5CUSER%5CDocuments%5Cmom%20effect%5C%3F_action%3Darticle%26au%3D335931%26_au%3DEsraa%2BA.%2BElmazzahy) E. Own Mother's Milk Protects against Necrotizing Enterocolitis, Sepsis and Poor Outcome of Preterm Infants.Paediatric Science Journal.2022https://doi.org/10.21608/cupsj.2022.141694.1057

10. Ochoa TJ, Mendoza K, Carcamo C, Zegarra J, Bellomo S, Jacobs J, Cossey V. Is Mother's Own Milk Lactoferrin Intake Associated with Reduced Neonatal Sepsis, Necrotizing Enterocolitis, and Death? Neonatology. 2020;117(2):167-174. doi: 10.1159/000505663.

11. Lund AM, Domellöf M, Pivodic A, Hellström A, Stoltz Sjöström E, Hansen-Pupp I. Mother's Own Milk and Its Relationship to Growth and Morbidity in a Population-based Cohort of Extremely Preterm Infants. J Pediatr Gastroenterol Nutr. 2022 Feb 1;74(2):292-300. doi: 10.1097/MPG.0000000000003352.

12. Spiegler,J.,Preu M, Gebauer C, Bendiks M, Herting E, Göpel W, Berghäuser, M.A., Böckenholt,K, Bohnhorst B, Böttger R.Does Breastmilk Influence the Development of Bronchopulmonary Dysplasia? *Journal of Pediatrics.2016;* 169, :76–80.

13. Schanler RJ. Outcomes of Human Milk-Fed Premature Infants. *Seminars in Perinatology, 2011;* 35:29–33.

14. Vohr BR, Poindexter BB and Dusick AM. Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months of age. *Pediatrics. 2006;*118(1):115–123.

15. Donath SM and Amir LH. Effect of gestation on initiation and duration of breast feeding. *Archives of Disease in Childhood, Fetal and Neonatal Edition.2*008; 93:448-4

16. Ward L, Auer C, Smith C, et al. The human milk project: A quality improvement initiative to increase human milk consumption in very low birth weight infants. *Breastfeed Med*. 2012; 7:234–240.

1. Chiang KV, Sharma AJ, Nelson JM, Olson CK, Perrine CG. Receipt of Breast Milk by Gestational Age - United States, 2017. MMWR Morb Mortal Wkly Rep. 2019 Jun 7;68(22):489-493. doi: 10.15585/mmwr.mm6822a1.

18.Mitha A., Piedvache A., Glorieux I., Zeitlin J., Roué J.M., Blondel B., Durox M., Burguet A., Kaminski M., Ancel P.Y., et al. Unit policies and breast milk feeding at discharge of very preterm infants: The EPIPAGE-2 cohort study. Paediatr. Perinat. Epidemiol. 2019;33:59–69. doi: 10.1111/ppe.12536

19.Oras P., Thernström Blomqvist Y., Hedberg Nyqvist K., Gradin M., Rubertsson C., Hellström-Westas L., Funkquist E.L. Skin-to-skin contact is associated with earlier breastfeeding attainment in preterm infants. Acta Paediatr. Int. J. Paediatr. 2016;105:783–789. doi: 10.1111/apa.13431

20.Tully K.P., Holditch-Davis D., White-Traut R.C., David R., O’Shea T.M., Geraldo V. A Test of Kangaroo Care on Preterm Infant Breastfeeding. J. Obstet. Gynecol. Neonatal Nurs. JOGNN. 2016;45:45–61. doi: 10.1016/j.jogn.2015.10.004.

21.Mekonnen A.G., Yehualashet S.S., Bayleyegn A.D. The effects of kangaroo mother care on the time to breastfeeding initiation among preterm and LBW infants: A meta-analysis of published studies. Int. Breastfeed. J. 2019;14 doi: 10.1186/s13006-019-0206-0.

22.Maastrup R., Hansen B.M., Kronborg H., Bojesen S.N., Hallum K., Frandsen A., Kyhnaeb A., Svarer I., Hallström I. Factors associated with exclusive breastfeeding of preterm infants. Results from a prospective national cohort study. PLoS ONE. 2014;9:e89077. doi: 10.1371/journal.pone.0089077.

23.Davanzo R., Monasta L., Ronfani L., Brovedani P., Demarini S. Breastfeeding at NICU Discharge. J. Hum. Lact. 2013;29:374–380. doi: 10.1177/0890334412451055.

24.Pineda R.G. Predictors of Breastfeeding and Breastmilk Feeding Among Very Low Birth Weight Infants. Breastfeed. Med. 2011;6:15–19. doi: 10.1089/bfm.2010.0010.

25.Zachariassen G., Faerk J., Grytter C., Esberg B., Juvonen P., Halken S. Factors associated with successful establishment of breastfeeding in very preterm infants. Acta Paediatr. 2010;99:1000–1004. doi: 10.1111/j.1651-2227.2010.01721.x

26.Parker LA, Sullivan S, Krueger C, Kelechi T, Mueller M. Effect of early breast milk expression on milk volume and timing of lactogenesis stage II among mothers of very low birth weight infants: a pilot study. J Perinatol. 2012 Mar;32(3):205-9. doi: 10.1038/jp.2011.78.

27.Ru X, Huang X, Feng Q. Successful Full Lactation Achieved by Mothers of Preterm Infants Using Exclusive Pumping. Front Pediatr. 2020 Apr 24;8:191. doi: 10.3389/fped.2020.00191.

28.Kent J.C., Prime D.K., Garbin C.P. Principles for maintaining or increasing breast milk production. J. Obstet. Gynecol. Neonatal Nurs. 2012;41:114–121. doi: 10.1111/j.1552-6909.2011.01313.x

29.Heller N, Rüdiger M, Hoffmeister V, Mense L. Mother's Own Milk Feeding in Preterm Newborns Admitted to the Neonatal Intensive Care Unit or Special-Care Nursery: Obstacles, Interventions, Risk Calculation. Int J Environ Res Public Health. 2021 Apr 14;18(8):4140. doi: 10.3390/ijerph18084140.

30.Casey L., Fucile S., Dow K.E. Determinants of Successful Direct Breastfeeding at Hospital Discharge in High-Risk Premature Infants. Breastfeed. Med. 2018;13:346–351. doi:10.1089/bfm.2017.0209.

31.Zachariassen G., Faerk J., Grytter C., Esberg B., Juvonen P., Halken S. Factors associated with successful establishment of breastfeeding in very preterm infants. Acta Paediatr. 2010;99:1000–1004. doi: 10.1111/j.1651-2227.2010.01721.x.

 32.Reddy, V.N., Murugesan, A. & Adhisivam, B. Factors Affecting Mother’s Own Milk (MOM) Usage in the NICU – A Cross-sectional Study. Indian J Pediatr 91, 873 (2024). https://doi.org/10.1007/s12098-024-05083-4

33.Medina IMF, Fernández-Sola C, López-Rodríguez MM, Hernández-Padilla JM, Lasserrotte MDMJ, Granero-Molina J. Barriers to providing mother’s own milk to extremely preterm infants in the NICU. Adv Neonatal Care. 2019;19:349–60.

34.Mercado K, Vittner D, Drabant B, McGrath J. Neonatal intensive care unit-specific lactation support and mother’s own breast milk availability for very low birth-weight infants. Adv Neonatal Care. 2019;19:474–81.

35.Ikonen R, Paavilainen E, Helminen M, Kaunonen M. Preterm infants’ mothers’ initiation and frequency of breast milk expression and exclusive use of mother’s breast milk in neonatal intensive care units. J Clin Nurs. 2018;27:e551–8.

36.Breastfeeding barriers for Preterm infants in neonatal intensive care unit environments: a systematic Assessment and Meta-Analysis .Chuntian Liu, Mengqing Pan, Xiaoyu Lu, Ying Gao, Jianhong Xu, Xiaochun Chen .Breastfeeding Medicine 19 (7), 505-514, 2024

37.Kulkarni V, Murki S, Pawale D, et al. Quality improvement initiative to improve mother’s own milk usage till hospital discharge in very low birth weight infants from a tertiary care NICU. J Perinatol. 2020;40:1273–1281.

38.Bagga N, Nadipineni R, Mohaed A. A quality initiative to improve exclusive breast milk feeding in preterm neonates. Int J Pediatr Adolesc Med. 2018;5:131–134.

1. Miracle DJ, Meier PP, Bennett PA. Mothers’ decisions to change from formula to mothers’ milk for very-low-birth-weight infants. J Obstet Gynecol Neonatal Nurs. 2004;33:692–703.

40. Hoban R, Bigger H, Patel AL, et al. Goals for human milk feeding in mothers of very low birth weight infants: How do goals change and are they achieved during the NICU hospitalization. Breastfeed Med. 2015;10:305–311.

41. Meier PP, Engstrom JL, Patel AL, et al. Improving the use of human milk during and after the NICU stay. Clin Perinatol. 2010; 20(7):217–245.

42. Kalluri NS, Burnham LA, Lopera AM, et al. A quality improvement project to increase mother’s milk use in an inner-city NICU. Pediatr Qual Saf. 2019;4(5):e204.

43. Kaur S, Kaur G, Rawat HCL, et al. Quality improvement initiative: Improving proportion of preterm infants on mothers only milk at the time of discharge. Int J Contemp Pediatr. 2019;6(6):2334–2339.

44. Murphy L, Warner DD, Parks J, et al. A quality improvement project to improve the rate of early breast milk expression in mothers of preterm infants. J Hum Lact. 2014;30(4):398–401.

1. Dyson L, McCormick F, Renfrew MJ. Interventions for promoting the initiation of breastfeeding. Cochrane Database Syst Rev. 2016;11(11):CD001688.
2. Bagga N, Kurian S, Mohamed A, et al. A quality initiative to improve mother’s own milk feeding in preterm neonates. Breastfeed Med. 2020;15(10):616–621