



Antenatal breastfeeding promotion amongst pregnancies at high-risk for newborn admission to the NICU: A cross-sectional study

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ABSTRACT

Objectives: To determine the prevalence and factors associated with antenatal promotion of breastfeeding in high-risk pregnancies.

Study design: This was a cross-sectional study of trends in breastfeeding promotion during antenatal consultation of pregnancies at high-risk for newborn admission to the neonatal intensive care unit (NICU) between January 2017 and December 2020. Eligible high-risk pregnant patients undergoing antenatal consultation in a tertiary-level fetal assessment unit were identified using an electronic clinic repository. Consult letters and fetal assessment reports were reviewed to determine baseline demographics, pregnancy history, fetal findings, and communication about breastfeeding. Descriptive and inferential statistics were used to present findings and compare outcomes between groups.

Results: 316 pregnancies were included for final analysis. The mean maternal age was 28.7 years (SD 6.2) and 65 % were multiparas. Median gestational age at time of antenatal consult was 32 weeks [IQR 29–34]. The main indication for consultation was fetal anomalies (72.8%), namely cardiac defects (21.2 %). There was a significant improvement in prevalence of antenatal discussions about breastfeeding over the study period, from 48.8 % early in the study period compared to 73.7 % in the past year ($p = 0.036$). However, amongst consults where breastfeeding was discussed, almost one-quarter (23.8 %) of patients indicated that they were not planning on breastfeeding postnatally.

Conclusion: There has been a significant improvement in promoting breastfeeding antenatally amongst high-risk pregnancies. However, no follow-up or supports were offered to one-quarter of patients who indicated no intention of breastfeeding or using donor milk postnatally. Ongoing work is required to further advance breastfeeding promotion antenatally, increase parental supports and education, and optimize breastfeeding rates postnatally for improving outcomes of this high-risk group.

1. Introduction

Current national guidelines support exclusive breastfeeding for at least 6 months after birth and the World Health Organization recommends breastfeeding for a minimum of two years [1,2]. Breastfeeding is known to provide benefits for both the mother and child. For mothers, this includes decreasing the risk of postpartum depression, cardiovascular disease, breast and other cancers, as well as improving postpartum weight loss/return to pre-pregnancy body mass [1–4]. In infants, breastmilk provides the ideal nutritional requirements while conferring

passive immunity through passage of maternal antibodies; breastfeeding is also important for mother-child bonding [3,4]. Mothers who breastfed and children who were breastfed also have lower reported rates of obesity and associated health risks later in life [5]. Especially for premature infants, breastmilk is more easily digested than formula and promotes gastrointestinal maturation and development of normal microbiota, and is associated with lower rates of necrotizing enterocolitis and other neonatal complications following preterm birth [6–9].

Though the benefits of breastfeeding are numerous, admission of an infant to the neonatal intensive care unit (NICU) is known to create extra

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challenges for breastfeeding [10]. Non-initiation of breastfeeding is estimated for approximately 31–39 % of infants admitted to the NICU [7]. For those that do initiate breastfeeding, there are often delays in milk production that lead to subsequent delays in the timing of first feeds with human milk [8,9]. There is also mounting evidence that early initiation of pumping/breastfeeding postnatally is key for breastfeeding success and duration [10]. One study highlighted that breastfeeding needed to be initiated within 6 hours postpartum in order to significantly improve breastfeeding success and duration: only 20 % of those that initiated breastfeeding after the 6 hour mark were still breastfeeding at their 6 week postpartum visit [8]. In addition, donor breastmilk is now being used more widely in NICUs to improve feeding by human milk (versus formula) and bridge the gap to onset of maternal milk production [11]. Breastfeeding success in the NICU is multifactorial, but most research on barriers to breastfeeding in the NICU has focused on infants who were born preterm. Less is known about breastfeeding barriers for infants admitted to the NICU for other conditions beyond prematurity.

As timely and effective postnatal supports remain essential for insuring breastfeeding success, the influence of antenatal breastfeeding education on breastfeeding rates in the NICU remains largely unknown. The goal of this study was to determine the prevalence and factors associated with antenatal breastfeeding promotion in pregnancies at high-risk for newborn admission to the NICU. The findings of this work would help in the development of formal breastfeeding ‘bundles’ in the prenatal period that could be used to target education and supports to patients at increased risk of breastfeeding difficulty.

2. Methods

This was a cross-sectional study about trends in the antenatal promotion of breastfeeding in pregnant patients at a single tertiary care center between January 1, 2017 and December 31, 2020. All pregnant patients seen at the fetal assessment unit (FAU) with a high risk of having an infant requiring NICU admission and undergoing neonatal consult were eligible for inclusion. Patients seen in the unit who underwent antenatal consultation were identified using a neonatology clinical repository. Pregnancies with planned postnatal palliation were excluded. Consult letters and fetal ultrasound reports were hand-searched and a standardized data collection form used to abstract information about maternal demographics, medical and pregnancy complications, indication for referral, and plans for breastfeeding. The primary outcome of interest was promotion of breastfeeding at time of the antenatal consultation. Secondary outcomes included maternal and pregnancy characteristics associated with breastfeeding promotion versus no breastfeeding promotion, and discussion of donor milk.

Descriptive statistics were used to present the results. Continuous variables were presented as means with standard deviations (SD) if normally distributed or as medians with interquartile ranges [IQR] if non-parametrically distributed. Dichotomous and categorical variables were described as proportions (in %). Evaluation of breastfeeding promotion was calculated as a prevalence with the total number of antenatal consultations per year as the denominator. Student t-, Chi square, and Mann-Whitney U tests used to compare outcomes between groups. A p-value of < 0.05 was used to assume statistical significance for the primary outcome. Statistical analysis was performed using Stata v.14.2 (Stata Corp, College Station, TX, USA) software.

3. Results

316 high-risk pregnant patients underwent consultation during our study period. The mean maternal age was 28.7 years (SD 6.2) and median gestational age at time of consult was 32 weeks [IQR 29–34] (Table 1). Most patients were multiparous (65 %). The most common indication for referral was congenital anomalies (72.8 %), namely congenital heart defects (21.2 %) (Table 1). Other indications for

Table 1

Characteristics of pregnant patients at high-risk for NICU admission and indication for consult.

Characteristics	Samples size (N = 316)
Maternal Age	28.7 ± 6.2 years
Gestational Age at Consult	32 weeks [IQR 29–34]
Nulliparity	35.0 %
Indication for Referral	
Anomalies	72.8 %
Cardiac Defects	21.2 %
Genetic Syndromes	12.0 %
Complications of Multiples	5.7 %
Placental Insufficiency/HTN	4.4 %
Fetal Hemolytic Disease	1.9 %
Other	3.2 %

BF, Breastfeeding.

referral included genetic syndromes (12.0 %), complications of multiples (5.7 %), placental insufficiency/hypertension (4.4 %), among others (3.2 %) (Table 1).

There was a significant improvement breastfeeding promotion during the study period ($p = 0.03$) (Fig. 1). In total, 43 % of patients received no information about breastfeeding during their antenatal consultation at the start of the study period, although by the end of study period this number had decreased to ~ 25 % (Fig. 1). In addition, almost one-quarter of high-risk patients that received antenatal breastfeeding promotion disclosed not planning on breastfeeding after giving birth. There was no difference in maternal age (28.3 years (SD 4.2) versus 27.9 years (SD 6.1); $p = 0.491$), multiparity (35.8 % versus 30 %; $p = 0.297$), indication for consult, or other characteristics between those that received antenatal breastfeeding promotion and those that received none (Table 2). Promotion of donor milk also increased significantly during the study period from 1.3 % in 2017 to 47.6 % in 2020 (Fig. 1). Expansion of our local donor milk bank in 2019 also correlated with the large increase in promotion of donor milk during consultations. Pumping was discussed with 28.1 % of patients in this group and donor milk was discussed with 20.8 % (Table 2).

4. Discussion

Promotion and support of breastfeeding by healthcare providers is integral for improving its likelihood and success postpartum [7–9]. This study has shown that while there was a significant improvement in breastfeeding promotion at our hospital during the study period, there remains opportunity to do better - especially for the 1 in 4 high-risk patients where breastfeeding was not even discussed during perinatal consultation. In addition, almost one-quarter of patients who did receive antenatal breastfeeding promotion went on to state that they were still not planning on breastfeeding, and no follow-up was offered to discuss this further or explore the reasons why. We were somewhat surprised that there was no difference in characteristics or indication for referral between those patients who received antenatal breastfeeding promotion and those that did not, suggesting that a more standardized approach and/or institutional approach to breastfeeding promotion might serve to improve rates.

Expansion of our local donor milk bank correlated with the increase in promotion of donor milk over the course of the study period, and may have inadvertently contributed to enhanced discussions about breastfeeding by neonatologists and maternity care providers of these high-risk pregnancies. While donor milk is a good mitigation strategy for high-risk newborns that stand the most to gain from receipt of human milk, and a better option than use of formula, there is mounting evidence that it remains inferior to mother’s own breastmilk [12–14]. Pasteurized donor milk was found to have lower protein and overall energy content compared to maternal breast milk, as well as lower levels of antibodies that aide in passive immunity: in some instances, pasteurized donor milk may not even meet the high metabolic demands

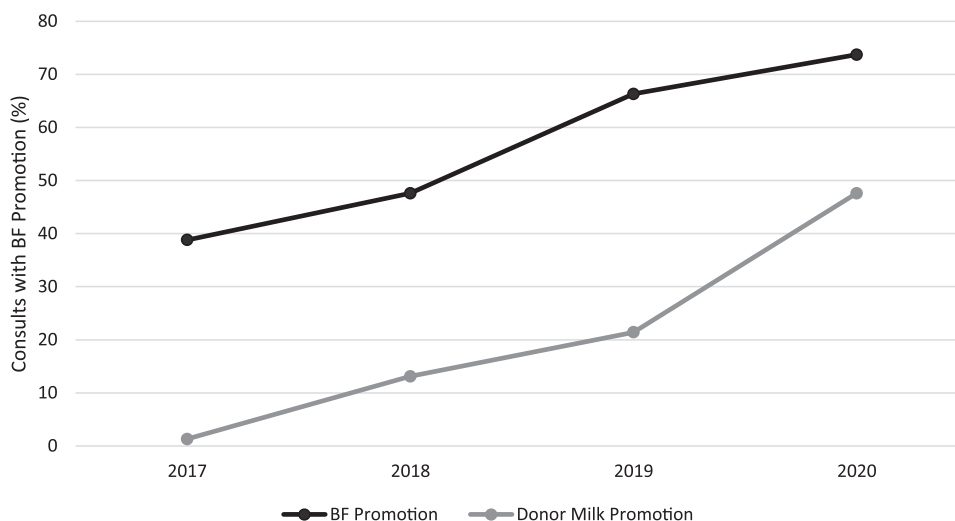


Fig. 1. Temporal trends in breastfeeding (BF) promotion at single tertiary care center.

Table 2

Characteristics between pregnant patients that received versus did not receive breastfeeding promotion at antenatal consult.

Characteristics	+ BF Promotion N = 179	No BF Promotion N = 137	p-value
Maternal Age, years (SD)	28.3 (4.2)	27.9 (6.1)	0.491
Gestational Age, weeks	31.2	31.0	0.679
Nulliparity	35.8 %	30.0 %	0.279
Main Indication for Consult	Anomalies 77.0 %	Anomalies 79.1 %	0.656
Plans for Feeding			
Planning to BF	76.2 %	NA	–
Pumping Discussed	28.1 %	NA	–
Donor Milk Discussed	20.8 %	NA	–

BF, Breastfeeding.

of infants in the NICU [12–16]. Somewhat interesting are the described differences in maternal characteristics between those that opt for donor milk versus formula [17]. In one study, mothers choosing formula over donor milk tended to have higher BMI and lower education than those opting for donor milk [17]. While there were no differences in breastfeeding self-efficacy between groups, those using donor milk had a lower likelihood of feeding breastmilk to their infants at 1 month of life and were more likely to provide expressed breastmilk (versus direct breastfeeding) [17]. We speculate that these findings may reflect underlying beliefs or assumptions that donor milk is ‘equivalent’ to mother’s own breastmilk, but parental perceptions about feeding options warrants further study. In another study, we also found that early supplementation with formula was more common amongst patients that continued breastfeeding to discharge from NICU than those with early breastfeeding discontinuation [18]. More work is needed to explore patient factors and beliefs about breastfeeding and the various options of feeding sources.

Use of breastmilk during infancy is known to have positive impacts on both short- and long-term outcomes of children [4,18–23]. Breastfeeding is especially beneficial for neonates admitted to the NICU as it has been shown to increase survival and decrease rates of neonatal complications. In preterm infants donor milk has been shown to decrease the incidence of NEC, sepsis, mortality, and retinopathy of prematurity [18–20]. Use of breastmilk has also been shown to improve cognitive development in preterm infants [4]. In our cohort of high-risk pregnancies with planned postnatal admission to NICU, most referrals were for congenital anomalies - congenital heart disease being the most common. In children with congenital heart disease, receipt of breastmilk has been shown improve weight-for-age scores compared to infants on

formula [21,22] and also thought to decrease NEC in this population irrespective of gestational age at delivery [22].

Timing of breastfeeding initiation is known to be particularly important and earlier initiation is associated strongly with timing of early skin-to-skin contact at the time of birth as well as maternal opinions on breastfeeding [24]. Two themes have emerged when barriers to breastfeeding in the NICU have been explored in other studies: 1) difficulties expressing milk and support for milk expression, and 2) the uninviting environment of the NICU. Many mothers expressed that the chaotic and unplanned nature of giving birth preterm and having to room separately from their child made it difficult to express milk: specifically, they felt unsupported breastfeeding when separated from their infant [25]. The clinical environment of the NICU was also described as uninviting to breastfeeding initiation, with some noting a feeling of self-consciousness when breastfeeding in the NICU [25]. Time to pumping postnatally is also an important factor for determining long-term breastfeeding outcomes [8,9]. Mothers of preterm infants who express milk within one hour after birth produce more breastmilk during the first 7 days of infant life than those who initiated after the one-hour mark. 60 % of mothers who expressed milk during the first hour continued to lactate at 6 weeks infant age, compared to only 20 % of mothers who expressed milk more than 6 hours after birth that were still lactating at the 6 week mark [8]. In high-risk neonates use of exclusive breastfeeding was also shown to lengthen the duration of exclusive breastfeeding in the postnatal period [26]. The short postnatal window in which to initiate breastfeeding makes antenatal conversations about the importance of breastfeeding even more important [18]. Better understanding the specific barriers of NICU admission to breastfeeding could also provide opportunities for targeted supports for these families.

Attendance of antenatal birth preparedness classes have been found to increase breastfeeding within one hour of birth [27] and better breastfeeding support during hospitalization is shown to improve breastfeeding [28]. Face-to-face interventions have also been shown to be more effective than in-home interventions (postpartum) on continuation rates of any breastfeeding at 16–26 weeks after birth, and highlights the importance of these conversations for facilitating knowledge translation to patients and empowering patients to make informed decisions about breastfeeding [29]. In our study we showed a significant improvement in antenatal counseling of high-risk patients over the last 4 years. Currently breastfeeding promotion occurs in approximately 75 % of patients who are at high-risk for NICU admission and are seen in the FAU. Consultation on the use of donor milk has also significantly increased over our study period. Unfortunately, one fourth of patients

where breastfeeding was discussed indicated no intention to breastfeed and were not followed up with at future appointments. Due to the many benefits of breastfeeding, particularly for neonates admitted to the NICU, conversations with parents about breastfeeding should be moved to the antenatal period – especially in those cases where the planned admission to NICU is known in advance of delivery. Those without plans to breastfeed should have follow-up planned with their individual maternity care provider to explore the associated factors; this also provides an opportunity for an alternate feeding plan, such as donor milk or ‘indirect’ breastfeeding (i.e. pumping with bottle feeding).

A major strength of this study is one of the first to provide baseline information about antenatal breastfeeding communication in pregnant patients with planned postnatal NICU admissions. As a cross-sectional review, we were able to calculate prevalence of antenatal breastfeeding promotion in an efficient and cost-effective manner. Because admission to our referral hospital represents a regional population, our results are generalizable to other centers with perinatal and neonatal medicine services. Our study was limited to the data available in the antenatal consult and fetal ultrasound record, and lacked information about many sociodemographic variables that might influence breastfeeding. We were also limited to only those patients with NICU admissions planned a priori, and our findings may not be translatable to those experiencing an unplanned NICU admission. We were also unable to link antenatal breastfeeding promotion with postnatal breastfeeding success, but this is the focus of future studies. Other research in this area is needed to explore the impact of standardized antenatal breastfeeding communication and early (prenatal) provision of breast pumps, colostrum collection kits and/or prescriptions for galactagogues on improving breastfeeding rates.

5. Conclusion

Our study shows a promising trend in increased promotion of breastfeeding among high-risk pregnancies, however there is still an opportunity for improvement. As there were no major differences in characteristics between those patients provided antenatal breastfeeding promotion compared to those that were not, there appear to be additional factors influencing antenatal conversations about breastfeeding which could be mitigated by a standardized approach or institutional policy for supporting these families. While admission to the NICU may pose as a barrier, breastfeeding is still possible for these families and their high-risk newborns who stand to gain the most from its receipt. Improved antenatal breastfeeding education and better postnatal supports will be important next steps to increase breastfeeding success in this complex population.

Declarations of interest

None.

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