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Original study

Effect of Early Breastfeeding Initiation and Hospital Practices on Exclusive Breastfeeding Success: A Prospective Cross-Sectional Study.

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Abstract

Background

Early breastfeeding initiation and supportive hospital practices are critical determinants of exclusive breastfeeding (EBF) success. Despite recommendations for early initiation and avoidance of prelacteal and unnecessary formula feeds, EBF rates remain suboptimal.

Objective

To evaluate the association of breastfeeding initiation timing and key hospital practices, including antenatal and postnatal counselling, prelacteal feeding, and in-hospital formula supplementation, with EBF success at 2.5 and 6 months of infant age.

Methods

A prospective study was conducted at Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, India, among 200 mother–newborn dyads. Participants were assessed within 48 hours of delivery and followed up at 2.5 and 6 months. Data on maternal characteristics, breastfeeding practices, hospital exposures, and barriers to EBF were collected using a structured questionnaire. Associations were assessed using chi-square tests and multivariate analysis.

Results

Breastfeeding initiation within 2 hours was significantly associated with EBF success at 2.5 months (84.0% vs. 35.5%; χ^2=31.4, p=0.001) and 6 months (87.0% vs. 71.0%; χ^2=5.31, p=0.021). In-hospital formula supplementation was associated with higher EBF failure at 2.5 months (51.7% vs. 10.3%; χ^2=41.25, p=0.001) and 6 months (41.4% vs. 13.6%; χ^2=10.62, p=0.001). Antenatal and postnatal counselling were significantly associated with improved EBF outcomes.

Conclusion

Early breastfeeding initiation, avoidance of unnecessary formula supplementation, and structured counselling were important modifiable factors associated with EBF success.

Recommendation

Hospitals should strengthen early breastfeeding support, minimize unnecessary supplementation, discourage prelacteal feeding, and provide structured antenatal and postnatal counselling and lactation support.

Keywords: *Exclusive breastfeeding; breastfeeding initiation; hospital practices; formula supplementation; antenatal counselling; prelacteal feeding; Baby-Friendly Hospital Initiative.*
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Introduction

Breastfeeding is globally recognized as the cornerstone of newborn nutrition. Human breast milk provides all essential nutrients an infant requires during the first six months of life and confers immunological protection against diarrhoeal illness, respiratory infections, and other common neonatal diseases.[1] Among all preventive health measures, optimal breastfeeding for newborns under two years of age has the greatest potential to enhance child survival.[2] The World Health Organization (WHO) and UNICEF recommend exclusive breastfeeding (EBF) — defined as feeding the newborn only breast milk, including expressed milk or milk from a wet nurse, for the initial six months of life — followed by the introduction of complementary foods while continuing breastfeeding for up to two years or beyond.[3]

The global burden of suboptimal breastfeeding is immense. A 2016 WHO factsheet highlighted that more than 800,000 deaths of children under five could be prevented annually if optimal breastfeeding practices were universally adopted.[4,5]

Despite this, fewer than 37% of infants under six months are exclusively breastfed worldwide.[6] In India, data from the National Family Health Survey (NFHS-3) demonstrated that only 46% of infants under six months were exclusively breastfed, and timely initiation within one hour of birth occurred in only 25% of deliveries.[7] These statistics reflect a wide implementation gap between policy intent and actual practice.

The timing of breastfeeding initiation is a critical determinant of EBF success. Delayed initiation has been linked to increased risks of neonatal morbidity and mortality,[8] greater reliance on prelacteal feeds,[9] deprivation of colostrum's immunological benefits,[10] loss of crucial maternal body warmth in the early postpartum period,[11] and a higher likelihood of introducing supplementary feeds within the first six months.[12] The WHO recommends initiating breastfeeding within the first hour after birth as one of the most effective strategies for reducing under-five mortality.[13] In China, while 98.3% of infants were breastfed at some point, early initiation within the first hour occurred in only 59.4% of deliveries, and EBF rates at five to six months were merely 13.6%.[14]

Hospital practices in the immediate postpartum period exert a profound influence on breastfeeding trajectories. The introduction of formula milk before establishing EBF reduces the frequency of breast stimulation and can undermine the newborn's ability to latch effectively, thereby contributing to early cessation of breastfeeding.[12] Nurses and healthcare providers are strategically positioned as primary sources of breastfeeding information and are critical in preventing the unnecessary introduction of formula, which negatively affects breastfeeding duration.[15,16] The Baby-Friendly Hospital Initiative (BFHI) was specifically designed to promote breastfeeding by ensuring hospitals follow best practices for supporting breastfeeding mothers in the immediate postpartum period.[17] Evidence from a randomized controlled trial demonstrated that postnatal telephonic support from healthcare providers significantly improves EBF rates.[18]

Prelacteal feeding — the provision of any food or liquid other than breast milk before breastfeeding initiation — prevents newborns from receiving colostrum and disrupts the establishment of EBF. In India, nearly 57% of mothers gave their newborns something besides breast milk in the first three days of life. A lack of supportive environment — including limited breastfeeding facilities, inadequate maternity leave, and social stigma — further hinders breastfeeding globally.[19,20]

In Uttarakhand, breastfeeding practices remain suboptimal despite national programs and government initiatives. Community-based data suggest that only 21.37% to 37.4% of mothers initiate breastfeeding within the first hour.[21] Against this backdrop, the present longitudinal study was undertaken to systematically evaluate the effect of timing of breastfeeding initiation and key hospital practices including antenatal and postnatal counselling, formula supplementation before discharge, and prelacteal feeding on EBF success in a tertiary care hospital setting in Dehradun.

Materials and methods

Study Design and Setting

This prospective observational study with longitudinal follow-up was conducted at Shri Guru Ram Rai Institute of Medical and Health Sciences (SGRRIM&HS), Dehradun, Uttarakhand, India. The institution is a tertiary-care teaching hospital providing obstetric, neonatal, and pediatric healthcare services. Mother–infant dyads meeting the predefined eligibility criteria were recruited after delivery and assessed at baseline, within 48 hours of delivery, with subsequent follow-up assessments at 2.5 months and 6 months after delivery. The study evaluated breastfeeding practices, hospital-related breastfeeding exposures, and barriers to exclusive breastfeeding (EBF) during the follow-up period.

The study was conducted over an 18-month period following approval from the Institutional Ethics Committee (IEC). Written informed consent was obtained from all participating mothers before enrolment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Sample Size and Participants

The minimum required sample size was calculated using a two-sided significance level of 5% ($Z\alpha/2 = 1.96$), 80% power ($Z\beta = 0.84$), and the assumptions used for the study, yielding a minimum sample size of 123 participants. Considering an anticipated attrition rate of 20%, 200 mother–newborn dyads were recruited.

Mothers were eligible for inclusion if they had delivered at SGRRIM&HS, were breastfeeding their newborns, provided informed consent, and had a newborn who was transferred to the mother's side for routine newborn care. Newborns and their mothers were required to be available for follow-up until 6 months of age.

Mothers or infants requiring intensive care or those who were clinically unstable were excluded. Infants with congenital malformations incompatible with breastfeeding, such as cleft palate, were also excluded. Mothers who declined participation or did not provide informed consent were excluded.

Data Collection

Data were collected using a structured questionnaire administered at baseline and during follow-up. The questionnaire included four major domains: (1) maternal and infant characteristics, including maternal age, educational status, occupation, mode of delivery, birth weight, and gestational age; (2) breastfeeding practices, including timing of breastfeeding initiation, exclusive breastfeeding, prelacteal feeding, supplementary feeding, and duration of breastfeeding; (3) reasons for failure to achieve EBF, including perceived insufficient milk supply, maternal employment, family or cultural factors, and lactational difficulties; and (4) maternal knowledge and perceptions regarding breastfeeding.

Follow-up information was obtained during scheduled visits. Mothers who were unable to attend follow-up visits were contacted by telephone, and the relevant breastfeeding information was collected through telephone interviews.

Measures to Minimize Bias

Several measures were undertaken to minimize potential sources of bias. Consecutive eligible mother–newborn dyads were recruited according to predefined inclusion and exclusion criteria [retain this sentence only if consecutive recruitment was actually used]. A structured questionnaire was used to ensure standardized collection of maternal, infant, hospital-practice, and breastfeeding-related information. The same predefined outcome criteria for EBF were applied throughout the follow-up period. Mothers who could not attend scheduled follow-up visits were contacted by telephone to minimize loss to follow-up. Potential confounding factors were considered during multivariate analysis to identify factors independently associated with EBF failure.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of Shri Guru Ram Rai Institute of Medical and Health Sciences, Dehradun, before commencement of the study. Written informed consent was obtained from all participating mothers. Confidentiality of participant information was maintained throughout the study, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Statistical analysis was performed using SPSS. Continuous variables were summarized using means and standard deviations, while categorical variables were presented as frequencies and percentages. Associations between categorical variables and EBF outcomes were assessed using the chi-square test. Multivariate analysis was performed to identify factors independently associated with EBF failure. A p-value <0.05 was considered statistically significant, and 95% confidence intervals (CIs) were calculated.

Results

A total of 200 mother–newborn dyads meeting the predefined eligibility criteria were recruited and included in the study. All 200 participants completed the baseline assessment within 48 hours of delivery and were included in the analysis of exclusive breastfeeding outcomes at 2.5 months. At 2.5 months, 169 participants achieved exclusive breastfeeding, whereas 31 did not. At the 6-month follow-up, data were available for 169 participants, who were included in the final analysis. Among these participants, 138 achieved exclusive breastfeeding and 31 did not. The participant flow from recruitment through follow-up and analysis is presented in Figure 1.

EBF Outcomes at 2.5 Months (n=200; Success=169, Failure=31)

Among mothers who initiated breastfeeding within 2 hours (n=153), 84% achieved EBF success at 2.5 months compared to only 35.5% in those initiating after 2 hours (n=47). The difference was highly significant (χ^2=31.4, p=0.001).

Antenatal counselling was significantly protective: only 19.4% of counselled mothers experienced EBF failure versus 80.6% of uncounselled mothers (χ^2=12.56, p=0.001).

Table 1: Timing of Breastfeeding Initiation and EBF Success at 2.5 Months

Initiation Time	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
≤2 hours (n=153)	142 (84.0%)	11 (35.5%)	31.4	0.001
>2 hours (n=47)	27 (16.0%)	20 (64.5%)	–	–

Table 2: Antenatal Counselling and EBF Outcomes at 2.5 Months

Antenatal Counselling	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Received (n=98)	92 (54.4%)	6 (19.4%)	12.56	0.001
Not Received (n=102)	77 (45.6%)	25 (80.6%)	–	–

Table 3: Sources of Antenatal Counselling and EBF Outcomes at 2.5 Months

Source	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Hospital (n=63)	58 (34.3%)	5 (16.1%)	4.21	0.040
Family (n=25)	18 (10.7%)	7 (22.6%)	3.89	0.049
ASHA (n=7)	7 (4.1%)	0 (0%)	1.32	0.251
Media (n=3)	2 (1.2%)	1 (3.2%)	0.76	0.384

Hospital-based counselling was the most effective source (34.3% EBF success, p=0.040), followed by family counselling (p=0.049). ASHA and media-based counselling did not reach statistical significance.

Table 4: Postnatal Counselling and EBF Outcomes at 2.5 Months

Postnatal Counselling	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Received (n=111)	98 (58.0%)	13 (42.0%)	6.78	0.009
Not Received (n=89)	71 (42.0%)	18 (58.0%)	–	–

Postnatal counselling was significantly associated with improved EBF outcomes. Mothers who received counselling had a 58% success rate versus 42% in those who did not (χ^2=6.78, p=0.009).

Table 5: Prelacteal Feeding and EBF Outcomes at 2.5 Months

Prelacteal Feed	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Given (n=2)	0 (0%)	2 (6.5%)	18.9	0.001
Not Given (n=198)	169 (100%)	29 (93.5%)	–	–

Prelacteal feeding was associated with 100% EBF failure. Both mothers who received prelacteal feeds failed EBF, a finding that was highly statistically significant (χ^2=18.9, p=0.001).

Table 6: Formula Feed Before Hospital Discharge and EBF Outcomes at 2.5 Months

Formula Feed Before Discharge	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Yes (n=60)	29 (48.3%)	31 (51.7%)	41.25	0.001
No (n=140)	140 (87.5%)	16 (10.3%)	–	–

In-hospital formula supplementation before discharge dramatically increased EBF failure: 51.7% in the formula group versus 10.3% in the non-formula group (χ^2=41.25, p=0.001).

Table 7: Breastfeeding Difficulties and EBF Outcomes at 2.5 Months

Difficulties Present	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Yes (n=40)	25 (14.8%)	15 (48.4%)	8.91	0.003
No (n=160)	144 (85.2%)	16 (51.6%)	–	–

Breastfeeding difficulties were significantly associated with EBF failure at 2.5 months (χ^2=8.91, p=0.003). Only 14.8% of mothers who faced difficulties succeeded compared to 85.2% of those who did not.

EBF Outcomes at 6 Months (Adjusted n=169)

Table 8: Timing of Breastfeeding Initiation and EBF Success at 6 Months

Initiation Time	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
≤2 hours (n=142)	120 (87.0%)	22 (71.0%)	5.31	0.021
>2 hours (n=27)	18 (13.0%)	9 (29.0%)	–	–

At 6 months, early initiation continued to confer a significant advantage — 87% success versus 13% in the delayed group (χ^2=5.31, p=0.021).

Table 9: Mode of Delivery and EBF Success at 6 Months

Mode of Delivery	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
NVD (n=132)	112 (81.2%)	20 (64.5%)	4.62	0.032
LSCS (n=37)	26 (18.8%)	11 (35.5%)	–	–

Mode of delivery was significantly associated with EBF at 6 months (p=0.032). Mothers with normal vaginal delivery (NVD) achieved higher success (81.2%) compared to those with lower segment caesarean section (LSCS) (64.5%).

Table 10: Antenatal Counselling and EBF Outcomes at 6 Months

Antenatal Counselling	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Received (n=92)	85 (61.6%)	7 (22.6%)	13.2	0.001
Not Received (n=77)	53 (38.4%)	24 (77.4%)	–	–

Antenatal counselling remained strongly protective at 6 months: 22.6% failure in the counselled group vs 77.4% in the uncounselled group (χ^2=13.2, p=0.001).

Table 11: Postnatal Counselling and EBF Outcomes at 6 Months

Postnatal Counselling	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Received (n=98)	85 (61.6%)	13 (41.9%)	4.35	0.037
Not Received (n=71)	53 (38.4%)	18 (58.1%)	–	–

Postnatal counselling significantly improved EBF success at 6 months (61.6% vs 38.4%; χ^2=4.35, p=0.037).

Table 12: Formula Feed Before Hospital Discharge and EBF Outcomes at 6 Months

Formula Feed Before Discharge	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Yes (n=29)	17 (58.6%)	12 (41.4%)	10.62	0.001
No (n=140)	121 (86.4%)	19 (13.6%)	–	–

The negative impact of pre-discharge formula supplementation persisted at 6 months: success rate 58.6% in the formula group versus 86.4% in the non-formula group (χ^2=10.62, p=0.001).

Table 13: Breastfeeding Difficulties and EBF Outcomes at 6 Months

Difficulties Present	EBF Success n (%)	EBF Failure n (%)	χ^2	p-value
Yes (n=40)	18 (13.0%)	22 (71.0%)	14.9	0.001
No (n=129)	120 (87.0%)	9 (29.0%)	–	–

Breastfeeding difficulties continued to significantly predict EBF failure at 6 months (χ^2=14.9, p=0.001), with only 13% of mothers facing difficulties achieving EBF success.

Table 14: Type of Breastfeeding Difficulty, Resolution, and EBF Outcomes at 6 Months (n=40)

Difficulty Type	n	Resolution	EBF Success	EBF Failure	p-value
Insufficient Milk	22	Partial (counselling, ↑frequency)	8 (36.4%)	14 (63.6%)	0.001
Latching Issues	8	Partial (latch support)	4 (50.0%)	4 (50.0%)	0.290
Retracted Nipples	7	Yes (syringing)	6 (85.7%)	1 (14.3%)	0.572
Baby Too Demanding	3	No	1 (33.3%)	2 (66.7%)	0.024

Unresolved (stress/work)	18	None	5 (27.8%)	13 (72.2%)	0.001

Insufficient milk supply was the most common difficulty (n=22) and despite counselling, remained associated with EBF failure in 63.6% of cases. Unresolved difficulties — encompassing maternal stress, working outside the home, and conflicting family advice — showed the highest failure rate (72.2%, p=0.001).

Discussion

This longitudinal study offers strong institution-specific evidence that timely breastfeeding initiation and hospital practices, especially avoiding in-hospital formula supplementation, are strong independent predictors of EBF in the first six months. The results have practical implications for clinical practice and hospital policy in India where EBF rates are well below the WHO stipulated target rate of 50%.[3]

Effect of Early Breastfeeding Initiation

The most remarkable outcome of this study was the strong link between time of initiation of breastfeeding and EBF success. EBF success rates of mothers with early initiation (within 2 hours) were 84% and 87% at 2.5 and 6 months respectively, while corresponding rates of mothers initiating breastfeeding later than 2 hours were 35.5% and 71%. The p-values (p=0.001 and p=0.021) reflect the fact that early initiation of breastfeeding is not a short-term gain, as it has a sustained effect on exclusive breastfeeding over the entire period. These results are in line with the global evidence on the association between early initiation of breastfeeding within 1 hour after delivery and higher EBF and better health outcomes for newborns.[22]

The World Health Organisation (WHO)-recommended Ten Steps to Successful Breastfeeding program, assessed in a cluster-randomised controlled trial in the Democratic Republic of Congo, also demonstrated that early initiation policies were associated with significantly improved EBF outcomes.[23] Community-based data from Uttarakhand show that only 21.37% to 37.4% of mothers initiate breastfeeding in the first hour, highlighting a significant gap between the evidence and practice of early initiation.[21]

This is backed by sound physiological evidence. Early suckling stimulates oxytocin release, promotes milk let-down and facilitates optimal latch-on for breastfeeding.[26] Infants who receive breast milk within an hour of birth receive colostrum, described as the "first vaccine" of the infant, which provides essential immune protection through its content of secretory IgA, lactoferrin and other bioactive substances.[25] Conversely, delayed initiation robs the infant of the warmth and comfort of the mother's body in the early hours after birth, and increases the risk of supplementary feeds being introduced during the first six months of life.[11,12] These results indicate the need for protocols in the delivery room and the postnatal ward to ensure breastfeeding initiation within two hours of birth, regardless of the mode of delivery.

Effect of In-Hospital Formula Supplementation

Formula supplementation in hospital before discharge was the strongest predictor of EBF failure in this study. In the group given formula in hospital (n=60), 51.7% stopped EBF at 2.5 months (χ^2=41.25, p=0.001) compared to 10.3% in the unexposed group - a five-fold increase. At 6 months, this was still evident, with 41.4% EBF failure in the formula-supplemented group and 13.6% in the non-supplemented group (χ^2=10.62, p=0.001). These results confirm evidence that the provision of formula in hospital is associated with early breastfeeding failure, even when mothers are first-time and have plans for exclusive breastfeeding (EBF).[27]

The early introduction of formula has been shown to reduce rates of EBF by affecting infant feeding behaviours and reducing the frequency of suckling, which in turn reduces milk production.[22] A study of infant feeding practices at a tertiary care hospital in the Garhwal Himalayan region of Uttarakhand found that the use of supplementary feeds in the immediate perinatal period was associated with reduced EBF rates.[29] A retrospective study among urban mothers in Maharashtra also reported that hospital recommendations for "top feeds" to supplement breastmilk during initial hospitalisation resulted in continued mixed feeding during the first year of life.[30]

In addition, formula supplementation leads to decreased frequency of breast stimulation and secretion of prolactin, which impairs milk production. Bottle feeding can cause nipple confusion and affect the attachment. Moreover, formula supplementation implies to mothers that their milk is inadequate, which may lower their confidence - a key psychological predictor of breastfeeding success. In our study, insufficient milk supply was the most common breastfeeding problem (n=22), with 54.5% of affected mothers failing EBF at 2.5 months and 63.6% at 6 months. Bhanderi et al. reported perception of insufficient milk being a significant barrier to EBF in rural Gujarat.[31]

Importance of Antenatal and Postnatal Counselling

Our study found antenatal and postnatal counselling were important factors associated with success in EBF. At 2.5 months, 19.4% of mothers in the counselling group failed to

achieve EBF, while 80.6% of the uncounselled group did (χ^2=12.56, p=0.001). By 6 months, the effect of antenatal counselling persisted (22.6% failure in counselled mothers, 77.4% failure in uncounselled mothers, χ^2=13.2, p=0.001). Postnatal counselling also protected at these two time points (p=0.009 and p=0.037). These results are well supported by evidence showing that breastfeeding counselling is effective in improving EBF rates by boosting maternal self-confidence and offering personalised advice.[32]

A community-based study in Uttarakhand showed that mothers receiving antenatal counselling were significantly more likely to initiate breastfeeding early and achieve EBF[33]. A randomized controlled trial found that postnatal telephonic support by health-care providers significantly improved EBF rates by overcoming challenges in the first weeks after birth[18]. A descriptive study conducted at a tertiary care centre in Dehradun found that while most mothers acknowledged that breast milk was the best for their baby, only 55% knew that colostrum was important and less than 64% had adequate knowledge about duration of EBF,[34] identifying key areas that require antenatal counselling.

In this study, counselling from the hospital was the most successful (34.3% EBF success; p=0.040), followed by family counselling (p=0.049). Our study found ASHA counselling had a high success rate (85.7%), although the small sample size limits the ability to draw conclusions. This suggests that community health worker programs can be effective complementary approaches, [34] and Rollins et al. highlighted the lack of supportive environment - such as limited breastfeeding facilities, insufficient maternity leave and social stigma - as a barrier to breastfeeding worldwide, [19] suggesting counselling should include strategies to overcome social and workplace issues.

Effect of Mode of Delivery

At 6 months, mode of delivery had a significant effect on EBF (χ^2=4.62, p=0.032), with higher success in mothers who gave birth through normal vaginal delivery (NVD) (81.2%) than those who had a low segment caesarean section (LSCS) (64.5%). This is in line with research that shows caesarean sections may delay the initiation of breastfeeding due to the longer recovery times, spinal anaesthesia and positioning difficulties due to post-caesarean pain.[40] One study at a tertiary care centre in Puducherry found that delayed recovery from spinal anaesthesia and pain after the caesarean were the major factors in delaying the initiation of breastfeeding and reducing the EBF rates.[39] Importantly, at 2.5 months there was no significant difference between the groups (p=0.077), which suggests that good post-natal support could reduce the effect of operative delivery, especially if early initiation of breastfeeding is promoted.

Effect of Prelacteal Feeding

Prelacteal feeding was found to be a cause of 100% failure of EBF in the current study (χ^2=18.9, p=0.001). While the number of women providing prelacteal feed was small (n=2), this is reflective of good control at the hospital where the study was conducted, the result is in line with international findings. The prevalence of prelacteal feeding in Nepal is 28.9%.[35] Cultural studies from the state of Maharashtra have identified honey, jaggery water, sugar water and castor oil as common prelacteals.[36] Prelacteal feeding denies newborns the opportunity to receive colostrum and delays establishment of attachment to the breast, resulting in early breastfeeding cessation.[37] The current study finding affirms that no food or drink other than the mother's breastmilk should be given to the newborn in the perinatal period and must be backed by rigorous ward policies and good antenatal education.

Breastfeeding Difficulties

Breastfeeding difficulties were a significant predictor of EBF failure at 2.5 months (χ^2=8.91, p=0.003) and 6 months (χ^2=14.9, p=0.001). The most prevalent difficulty was perceived low milk supply (22/40 mothers), which - despite counselling and more frequent feeding - was associated with EBF failure in more than half the mothers at both time points. Unresolved difficulties, including maternal stress, working outside the home and conflicting family counselling, had the highest failure rate (72.2%; χ^2=14.2, p=0.001). At a tertiary care hospital in northern India, 88.5% of mother-newborn pairs faced breastfeeding difficulties prior to discharge, due to incorrect positioning and attachment of the newborn.[38] These observations suggest the need for active lactation support programs in hospitals, including the presence of a lactation consultant, systematic breastfeeding positioning and latch-on assessment prior to hospital discharge, and timely follow-up channels for mothers who experience difficulties after discharge.

Generalizability

The findings of this study may be applicable to mother–newborn dyads receiving care in hospital settings with similar patient populations, breastfeeding-support practices, and socioeconomic and cultural characteristics. The observed associations between early breastfeeding initiation, hospital-based breastfeeding practices, counselling, formula supplementation, and exclusive breastfeeding may be relevant to other healthcare facilities seeking to strengthen breastfeeding support. However, generalization beyond similar hospital settings should be undertaken with caution because the study was conducted at a single tertiary-care institution in Dehradun, Uttarakhand. Differences in healthcare infrastructure, institutional breastfeeding policies, maternal characteristics, cultural practices, and availability of

lactation support may influence breastfeeding outcomes in other settings. Multicentre studies involving diverse healthcare facilities and populations are therefore warranted to establish the broader applicability of these findings.

Study Limitations

This study has several limitations. First, it was conducted at a single tertiary-care institution, which may limit the generalizability of the findings to other hospitals and populations. Second, some breastfeeding information was obtained through maternal self-report, including information collected during telephone follow-up, which may have introduced recall or reporting bias. Third, the study may have been subject to loss to follow-up, particularly at the 6-month assessment, which could have influenced the observed breastfeeding outcomes. In addition, potential differences in maternal socioeconomic characteristics, family support, cultural practices, and access to breastfeeding support may have influenced exclusive breastfeeding outcomes. Finally, although multivariate analysis was performed to identify predictors of exclusive breastfeeding failure, residual confounding from unmeasured factors cannot be completely excluded.

Recommendation

Hospitals should strengthen early breastfeeding support by promoting breastfeeding initiation within the first hours after delivery, minimizing unnecessary in-hospital formula supplementation and prelacteal feeding, and providing structured antenatal and postnatal breastfeeding counselling. Continued lactation support during the postpartum period and follow-up should be encouraged to help mothers overcome common barriers to exclusive breastfeeding. Healthcare institutions should also consider strengthening practices consistent with the Baby-Friendly Hospital Initiative to support sustained exclusive breastfeeding.

Conclusion

This longitudinal study shows that early initiation (within 2 hours of birth) and abstention from in-hospital formula supplementation are the two strongest and most modifiable hospital-based predictors of exclusive breastfeeding (EBF) success at 2.5 and 6 months of infant age. Antenatal and postnatal counselling, especially hospital-based counselling, is a strong protective factor against EBF failure, while prelacteal feeding is linked with universal EBF failure. Cesarean section did emerge as a strong predictor of EBF failure at 6 months, but this may be tempered by effective postnatal counselling.

Acknowledgment

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List of Abbreviations

EBF – Exclusive breastfeeding
BFHI – Baby-Friendly Hospital Initiative
IEC – Institutional Ethics Committee
SGRRIM&HS – Shri Guru Ram Rai Institute of Medical and Health Sciences
SPSS – Statistical Package for the Social Sciences
CI – Confidence interval
LSCS – Lower-segment caesarean section
NVD – Normal vaginal delivery

Conflict of Interest

The authors declare no conflict of interest.

Availability of Data

The datasets generated and/or analyzed during the current study are not publicly available because they contain participant-related information and are subject to ethical and confidentiality considerations. De-identified data may be made available from the corresponding author upon reasonable request, subject to approval by the Institutional Ethics Committee and applicable institutional policies.

Author Contributions

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