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# Maternal and neonatal peripartum factors associated with late initiation of breast feeding in Bangladesh: a secondary analysis

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## ABSTRACT

**Objectives** Late initiation of breast feeding (LIBF) is associated with increased neonatal mortality and morbidity. This study aimed to assess the association between intrapartum, early postpartum and neonatal factors, and LIBF in Bangladesh.

**Design, setting and participants** In this analysis, we used data from the mothers participating in a cluster-randomised controlled trial (Rang-Din Nutrition Study) conducted in rural northwest Bangladesh. Mothers (n=3594) were interviewed about the time of initiation of breast feeding, and peripartum maternal and neonatal complications within the first 72 hours of delivery. LIBF was defined as initiation of breast feeding 1 hour after birth. Factors associated with LIBF were identified by multivariable logistic regression analysis.

**Main outcome measures** Prevalence and associated factors of LIBF.

**Results** The prevalence of LIBF was 18.5%. Factors significantly associated with LIBF in multivariable logistic regression were assisted vaginal delivery (adjusted OR (AOR) 2.17, 95% CI 1.44 to 3.27); delivery by caesarean section (AOR 9.67, 95% CI 7.21 to 12.96); maternal health problems during childbirth (AOR 1.61, 95% CI 1.30 to 2.00); preterm newborns (AOR 1.39, 95% CI 1.09 to 1.78); newborns moved slowly immediately after birth (AOR 1.43, 95% CI 1.05 to 1.94); and sick newborns (AOR 1.60, 95% CI 1.12 to 2.29).

**Conclusions** Findings from this study suggest that to reduce LIBF, peripartum maternal and neonatal complications should be prevented and treated.

**Trial registration number** NCT01715038.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ To our best knowledge, this is the first study that explores the association between peripartum maternal and neonatal factors and late initiation of breast feeding (LIBF) in Bangladesh.
⇒ Data on breastfeeding initiation and peripartum maternal and neonatal factors were collected within 72 hours of birth from the majority of the mothers to minimise recall bias.
⇒ The study was conducted among randomly selected participants in the community, which makes the study more generalisable than a hospital-based study.
⇒ Several explanatory variables were recorded based on the mother's answers to specific questions, which were not clinically assessed.
⇒ This cross-sectional analysis cannot establish a causal relationship between LIBF, and peripartum and neonatal factors.

## INTRODUCTION

The World Health Organization (WHO) recommends the initiation of breast feeding immediately after birth. Early breastfeeding initiation refers to providing breast milk to the newborn baby within the first hour of birth.[1] It is one of the effective steps of successful breastfeeding practice and a fundamental indicator of assessing appropriate infant and young children feeding practice.[2] The importance of promoting early breastfeeding initiation lies in the colostrum, which provides passive immunity to protect newborns from a wide variety of infections and allergic diseases. Colostrum contains at least 90 nutrient components, including amino acids, minerals and vitamins essential for the development of newborns.[3] Early initiation of breast feeding enhances breast milk production and minimises postpartum haemorrhage (PPH).[4]

Recent systematic reviews and global reports by WHO demonstrated that the risk of neonatal mortality rises by about 33% with the delay in breastfeeding initiation relative to those who initiate breast feeding within 1 hour of birth.[5 6] In 2015, 2.7 million newborns died during the first 28 days of life worldwide,[7] among them more than one-third of newborns died on the very first day.[8] The neonatal mortality rate in Bangladesh dropped from 55 per 1000 live births in 1990 to 30 per 1000 live births in 2017–2018.[9]

However, the neonatal deaths account for 67% of all the under 5 deaths in Bangladesh,[9] and early neonatal deaths contribute over 65% of the all neonatal deaths.[7] Despite the WHO recommendation and evidence of nutritional and immunological benefits of early breastfeeding initiation in reducing neonatal morbidity and mortality, it is not well practised by mothers, particularly in low-income and middle-income countries.[10 11] It has been reported that only 40% of newborns in South Asia are breast fed within the first hour.[6] Although there have been some improvements in breastfeeding practice in Bangladesh, 31.3% of the mothers still delay the initiation of breast feeding.[9]

There is also evidence that late initiation of breast feeding (LIBF) increases the chance of developing neonatal sepsis within the first week of life.[12] Late breastfed newborns also have less opportunity to get the full benefit of the immunological protection from colostrum.[13] Furthermore, mothers who delay the initiation of breast feeding most frequently deviate from exclusive breast feeding.[13 14] The promotion of breast feeding is a key component of child survival strategies. The 'Baby Friendly Hospital Initiatives (BFHI)' was launched in Bangladesh in 1992 to ensure exclusive breast feeding and early initiation of breast feeding.[15] In recent years, Bangladesh has achieved considerable progress in the breastfeeding and complementary feeding practices.[16] Nevertheless, to scale up the BFHI, we need to increase our knowledge of factors associated with the early initiation of breast feeding. Therefore, identifying the factors associated with LIBF is critical in developing and implementing strategies to improve the early initiation of breast feeding. Several studies have identified multiple barriers to breastfeeding initiation in Bangladesh such as maternal age,[10] education and occupation,[10] socioeconomic status,[10] cultural factors,[10] places of residence,[17] antenatal care (ANC)[18] and type of delivery.[18 19] However, we found no study that looked at the peripartum maternal and neonatal characteristics that might be associated with LIBF in Bangladesh. Peripartum period generally refers to the period shortly before, during and immediately after giving birth. Few studies conducted in India, UK and Peru have reported the association of some factors like duration of labour,[20] gestational age[21 22] and intrapartum complications[23] with the initiation of breast feeding. There is a gap concerning the knowledge of peripartum factors and their association with LIBF in Bangladesh. Considering these, this study aimed to fill the research gap in the literature.

In this study, we used data from a cluster-randomised controlled trial (Rang-Din Nutrition Study (RDNS)) conducted in rural northwest Bangladesh. Details of the survey have been stated elsewhere.[24] During the study period, mothers and newborns were visited within 72 hours after birth to collect birth-related information, which enabled us to explore the association between LIBF and peripartum maternal and neonatal factors. Identifying the peripartum maternal and neonatal factors that possibly influence LIBF is significant for the design and delivery of more effective strategies of early initiation of breast feeding.

## METHODS

### Study design

The data used in this present study was extracted from a specific time point of a large randomised controlled trial study (described further) in Bangladesh. The primary study consisted of data collection from several time points. However, we used data from one time point for our analysis, which makes this current study cross-sectional in nature.

### Study setting

RDNS was a longitudinal, researcher-blind, cluster-randomised effectiveness trial of nutrient supplementation for pregnant and lactating women as well as their children through 2 years of age, which was conducted in the 11 unions of Chirirbandar and Badarganj Upazilas in northwest Bangladesh. The detailed methodology of the trial was described elsewhere.[24] The study was executed by three partners: Lutheran Aid for Medicine in Bangladesh (LAMB), a non-government organisation in Dinajpur, Bangladesh; the University of California, Davis (UCD); and the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr, b). RDNS was executed within the community health and development programme (CHDP) administrated by LAMB. In RDNS, a cluster was defined by the working area of a LAMB's community health worker (CHW). Each cluster had a population range of 2500–6000 people. Health services provided by CHDP included maternal health facilities at a safe delivery unit (SDU), regular antenatal check-ups, postnatal check-ups, child care by village health volunteers (VHVs) and CHWs, and monthly health education sessions. The study interventions were provided by the LAMB. Both icddr, b, and UCD evaluated the study interventions.

### Enrolment and data collection

Pregnant women were identified by VHVs and CHWs as part of the LAMB's pregnancy surveillance system. The CHWs visited the identified pregnant women and pregnancy was confirmed by urine strips (Quick Check: Nanjing Hoshin Medical Instrument Co.). Women eligible for the RDNS were contacted by the evaluation members of the 'home visit team (HVT)' to attain informed consent for screening. Inclusion criteria were gestational age of ≤20 weeks, and no plan to leave the current residence during pregnancy or the following 3 years. Data collection was conducted by two teams: the 'SDU visit team' was responsible for collecting anthropometric and clinical data at SDU, and the HVT was responsible for collecting baseline and follow-up data during the pregnancy and after delivery at the participant's home. Following the completion of baseline and follow-up, participants were

scheduled for the anthropometric measurements and clinical data collection at SDU as described elsewhere.[24] We collected baseline data on socioeconomic status, food security, diet, and knowledge, practices and attitudes relevant to nutrition. During the pregnancy, the HVT made a home visit to collect data on diet and birth readiness at the 35th week of pregnancy, followed by an SDU visit at the 36th week for anthropometric measurements and biological specimen collection by the SDU team. A birth visit was conducted within 72 hours after birth at the household level and at the health facility level for the deliveries that occurred at health facilities. Data on delivery-related information, newborn's condition and feeding practices were collected at the birth visit with a face-to-face interview with the mother. Data collectors also checked the delivery records provided by the health facilities. We managed to reach the majority of the mothers within 72 hours after delivery; however, the mothers who were not available at the birth visit were revisited within 14 days of the delivery. To communicate with the study participant and her family, we created a call centre.

### Outcome variable

LIBF was the outcome variable in this study. Mothers were asked about how long after birth the baby was put on the breast for the first time. Responses were recorded in minutes/hours/days and subsequently categorised as within 1 hour and more than 1 hour. LIBF was defined as the initiation of breast feeding later than 1 hour after birth.

### Explanatory variables

We made a list of potential factors associated with LIBF based on literature review and the data available in our study. Demographic variables in this study included gender of the newborn (boy/girl); maternal age (<20, 20–30 and >30 years); maternal education (no education; 1–4, 5–9 and 10+ years); birth orders (1, 2–3 and ≥4); delivery place (home, government facilities, private facilities and others (on the way to hospital/delivery place or house of the village doctor/traditional healer)); and birth attendants (skilled or unskilled). The maternal and neonatal peripartum factors included in this analysis are type of delivery (normal vaginal delivery (NVD), NVD assisted with episiotomy/forceps delivery and caesarean section (C-section)); maternal health problems during child birth (yes/no): mother suffered from any kind of health problems or complications during her child birth; gestational age (<37 and ≥37 weeks and do not know); duration of labour (<12 and ≥12 hours): how long the labour persisted; induction of labour (yes, no and do not know): any injection was given to start/increase the labour; rupture of membrane before delivery (1–12 and >12 hours and do not know): duration from water broke to child delivery; foul-smelling watery discharge at delivery (yes, no and do not know): presence of any foul smell in the water/amniotic fluid discharged during the child birth; newborn's first breathe/cry (within 5 min, after 5 min, did not breathe/cry and do not know): how long after the birth baby started breathing/crying for the first time; newborn's movement immediately after birth (normally/forcefully, slowly, did not move and do not know): how the baby's first movement was after birth; overall condition of the baby (healthy/sick); birth injury (yes/no); and newborn cyanosis (yes, no and do not know): any part of the baby became blue immediately after birth. The category 'do not know' was coded when the mother did not know the answer and was excluded from the final analysis model.

### Statistical analysis

Though we used data from a randomised controlled trial, the analysis for this study was cross-sectional in nature. A previously published paper from this study reported that the intervention groups did not differ significantly regarding the newborn's timing on the initiation of breast feeding.[25] Therefore, we did not consider the intervention groups for this analysis. All the explanatory variables were categorical in this analysis. We used frequency distribution and percentage to describe the characteristics of the study population. We performed bivariable and multivariable logistics regression analyses to determine the association between the explanatory variables and LIBF. Multicollinearity test among the explanatory variables were checked by correlation coefficient. If the correlation coefficient was more than 0.5, it suggested that there was evidence of multicollinearity problem, and the variables were excluded from the final model. Lastly, the most important factors associated with LIBF were determined by stepwise logistic regression model. At 95% CI, a two-tailed p value of <0.05 was considered significant. We used Statistical Package for Social Sciences V.22.0 to analyse the data.

### Patient and public involvement

Neither patients nor the public were directly involved in conceptualisation, design, data collection or dissemination of this study. However, the data collection supervisors explained the study procedure and purpose to the local leaders to receive community consent.

## RESULTS

### Demographic, maternal and neonatal characteristics

A total of 3664 live births took place between 15 January 2012 and 5 May 2013 including 30 twin deliveries (including stillborn), and one twin from each pair was randomly selected for analysis, which is described elsewhere.[24] For this article, we analysed data of 3594 mother and child pairs who had the complete data on all the studied variables. Table 1 describes the characteristics of the mothers and newborns. The newborn's gender distribution was almost equal in our study: 50.2% were girls and 49.8% were boys. Nearly half of the mothers (48.2%) were younger than 20 years old. About 7.2% of the mothers had no formal education;

**Table 1** Characteristics of the participants and prevalence of LIBF according to demographic, peripartum maternal and neonatal characteristics

| Variables | Total, n (%) | Frequency of LIBF, n | Prevalence of LIBF (%) |
|---|---|---|---|
| | 3594 | 667 | 18.5 |
| Gender of the baby | | | |
| Girl | 1803 (50.2) | 353 | 19.6 |
| Boy | 1791 (49.8) | 314 | 17.5 |
| Maternal age (years) | | | |
| <20 | 1730 (48.2) | 318 | 18.4 |
| 20–30 | 1647 (45.8) | 299 | 18.2 |
| >30 | 217 (6.0) | 50 | 23.0 |
| Maternal education (years) | | | |
| No education | 258 (7.2) | 46 | 17.8 |
| 1–4 | 705 (19.6) | 115 | 16.3 |
| 5–9 | 2149 (59.8) | 391 | 18.2 |
| 10+ | 482 (13.4) | 115 | 23.9 |
| Birth order | | | |
| 1 | 1548 (43.1) | 339 | 21.9 |
| 2–3 | 1861 (51.8) | 291 | 15.6 |
| ≥4 | 185 (5.1) | 37 | 20.0 |
| Delivery place | | | |
| Home | 1704 (47.4) | 243 | 14.3 |
| Government facility | 423 (11.8) | 135 | 31.9 |
| Private facility | 1370 (38.1) | 253 | 18.5 |
| Others* | 97 (2.7) | 36 | 37.1 |
| Birth attendants | | | |
| Skilled | 2095 (58.3) | 397 | 19.0 |
| Unskilled | 1498 (41.7) | 269 | 18.0 |
| Type of delivery | | | |
| NVD | 2807 (78.1) | 356 | 12.7 |
| Assisted NVD | 204 (5.7) | 46 | 22.6 |
| C-section | 583 (16.2) | 265 | 45.5 |
| Maternal health problems during childbirth | | | |
| Yes | 1155 (32.1) | 347 | 30.0 |
| No | 2439 (67.9) | 320 | 13.1 |
| Gestational age (weeks) | | | |
| ≥37 (full-term) | 3028 (84.3) | 539 | 17.8 |
| <37 (preterm) | 544 (15.1) | 124 | 22.8 |
| Do not know | 22 (0.6) | 4 | 18.2 |
| Duration of labour (hours) | | | |
| <12 | 2610 (72.6) | 429 | 16.4 |
| ≥12 | 984 (27.4) | 238 | 24.2 |
| Induction of labour | | | |
| Yes | 1059 (29.5) | 225 | 21.2 |
| No | 2521 (70.1) | 437 | 17.3 |
| Do not know | 14 (0.4) | 5 | 35.7 |
| Rupture of membrane before delivery (hours) | | | |

Continued

Table 1 Continued

| Variables | Total, n (%) | Frequency of LIBF, n | Prevalence of LIBF (%) |
|---|---|---|---|
| 1–12 | 2748 (76.5) | 397 | 14.4 |
| >12 | 371 (10.3) | 97 | 26.2 |
| Do not know | 475 (13.2) | 173 | 36.4 |
| Foul-smelling watery discharge at delivery | | | |
| Yes | 211 (5.9) | 50 | 23.7 |
| No | 2912 (81.0) | 439 | 15.1 |
| Do not know | 471 (13.1) | 178 | 37.8 |
| Newborn's first breathing/crying | | | |
| Within 5 min | 3351 (93.2) | 598 | 17.9 |
| After 5 min | 203 (5.6) | 53 | 26.1 |
| Did not cry | 35 (1.1) | 15 | 42.9 |
| Do not know | 5 (0.1) | 1 | 20.0 |
| Newborn's movement immediately after birth | | | |
| Normally/forcefully | 3046 (84.7) | 521 | 17.1 |
| Slowly | 398 (11.1) | 99 | 24.9 |
| Did not move | 132 (3.7) | 39 | 29.6 |
| Do not know | 18 (0.5) | 8 | 44.4 |
| Overall condition of the baby after birth | | | |
| Healthy | 3279 (91.2) | 572 | 17.4 |
| Sick | 315 (8.8) | 96 | 30.5 |
| Birth injury | | | |
| Yes | 373 (10.4) | 78 | 20.9 |
| No | 3221 (89.6) | 589 | 18.3 |
| Newborn cyanosis | | | |
| Yes | 151 (4.2) | 36 | 23.8 |
| No | 3416 (95.0) | 626 | 18.3 |
| Do not know | 27 (0.8) | 5 | 18.5 |

*Others: on the way to the hospital/delivery place, house of village doctor/traditional healer.
C-section, caesarean section; LIBF, late initiation of breast feeding; NVD, normal vaginal delivery.

59.8% had completed primary education; and 13.4% had completed secondary education. Around 43% of the newborns were firstborn. The majority of the delivery took place at home (47.4%), followed by private health facilities (38.1%) and government health facilities (11.8%) (table 1). More than half of the delivery (58.3%) was assisted by skilled birth attendants. The prevalence of NVD was 78.1%; C-section was 16.2%; NVD assisted by episiotomy/forceps was 5.7%. Thirty-two per cent of mothers had experienced obstetric complications of any kind. At delivery, 15.1% of mothers had a gestational age of <37 weeks (preterm), and 84.3% had a gestational age of ≥37 weeks (full-term). For 27.4% of the mothers, the duration of labour was ≥12 hours. In 29.5% of the cases, there was a necessity for induction of labour. Rupture of membrane/water broke happened within 1–12 hours before delivery for 76.5% cases. About 5.9% of the mothers had reported experiencing a foul-smelling watery discharge at the time of delivery. Almost all the newborns (93.2%) breathed/cried within 5 min after birth, and 1.1% of the newborns had been reported as not breathing/crying just after delivery. Most of the newborns (84.7%) were reported as moving normally/forcefully immediately after birth. About 8.8% of the newborns seemed to be sick shortly after birth according to the mothers; 10.4% had experienced a birth injury of any kind; and 4.2% of the newborns were reported to become cyanosed immediately after birth.

### Prevalence and determinants of LIBF

The prevalence of LIBF was 18.5%. The frequency and prevalence of LIBF according to the demographic, intrapartum and neonatal characteristics are described in table 1. Table 2 represents the unadjusted OR (UOR)

Table 2 Bivariable and multivariable analyses of the determinants of late initiation of breast feeding

| Variables | UOR (95% CI) | P value | AOR (95% CI) | P value |
|---|---|---|---|---|
| Gender of the baby | | | | |
| Girl | Ref | | Ref | |
| Boy | 0.87 (0.74 to 1.03) | 0.115 | 0.81 (0.68 to 0.98) | 0.03 |
| Maternal age (years) | | | | |
| <20 | Ref | | Ref | |
| 20–30 | 0.98 (0.83 to 1.17) | 0.864 | 1.06 (0.87 to 1.29) | 0.555 |
| >30 | 1.33 (0.95 to 1.86) | 0.099 | 1.45 (0.99 to 2.12) | 0.056 |
| Delivery place | | | | |
| Home | Ref | | Ref | |
| Government facility | 2.82 (2.21 to 3.60) | <0.001 | 0.83 (0.60 to 1.15) | 0.258 |
| Private facility | 1.36 (1.12 to 1.65) | 0.002 | 0.35 (0.26 to 0.47) | <0.001 |
| Others** | 3.55 (2.30 to 5.47) | <0.001 | 1.94 (1.18 to 3.19) | 0.009 |
| Type of delivery | | | | |
| NVD | Ref | | Ref | |
| Assisted NVD | 2.00 (1.42 to 2.83) | <0.001 | 2.17 (1.44 to 3.27) | <0.001 |
| C-section | 5.74 (4.71 to 6.99) | <0.001 | 9.67 (7.21 to 12.96) | <0.001 |
| Maternal health problems during childbirth | | | | |
| No | Ref | | Ref | |
| Yes | 2.84 (2.39 to 3.38) | <0.001 | 1.61 (1.30 to 2.00) | <0.001 |
| Gestational age | | | | |
| Full-term | Ref | | Ref | |
| Preterm | 1.31 (1.10 to 1.55) | 0.002 | 1.39 (1.09 to 1.78) | 0.007 |
| Duration of labour (hours) | | | | |
| <12 | Ref | | Ref | |
| ≥12 | 1.62 (1.36 to 1.94) | <0.001 | 1.17 (0.95 to 1.45) | 0.145 |
| Newborn's first breathing/crying | | | | |
| Within 5 min | Ref | | Ref | |
| After 5 min | 1.63 (1.18, 2.25) | 0.003 | 1.23 (0.82 to 1.85) | 0.325 |
| Did not cry | 3.45 (1.76, 6.78) | <0.001 | 1.84 (0.81 to 4.18) | 0.147 |
| Newborn's movement immediately after birth | | | | |
| Normally/forcefully | Ref | | Ref | |
| Slowly | 1.60 (1.25 to 2.05) | <0.001 | 1.43 (1.05 to 1.94) | 0.022 |
| Did not move | 2.03 (1.38 to 2.99) | <0.001 | 1.44 (0.87 to 2.37) | 0.155 |
| Overall condition of the baby after birth | | | | |
| Healthy | Ref | | Ref | |
| Sick | 2.08 (1.61 to 2.69) | <0.001 | 1.60 (1.12 to 2.29) | 0.01 |

*Others: on the way to the hospital/delivery place, house of village doctor/traditional healer.
AOR, adjusted OR; C-section, caesarean section; NVD, normal vaginal delivery; ref, reference; UOR, unadjusted OR.

and adjusted OR (AOR) of the factors associated with LIBF. The factors which were significantly (p value of <0.05) associated with LIBF in the bivariable logistic regression analysis from stepwise regression analysis included delivery place (government facility (UOR 2.82, 95% CI 2.21 to 3.60); private facility (UOR 1.36, 95% CI 1.12 to 1.65); and others (UOR 3.55, 95% CI 2.30 to 5.47)); type of delivery (assisted NVD (UOR 2.00, 95% CI 1.42 to 2.83) and C-section (UOR 5.74, 95% CI 4.71 to 6.99)); maternal health problems during child birth (UOR 2.84, 95% CI 2.39 to 3.38); gestational age (UOR 1.31, 95% CI 1.10 to 1.55); duration of labour (UOR 1.62, 95% CI 1.36 to 1.94); newborn's first breathing/crying (after 5 min (UOR 1.63, 95% CI 1.18 to 2.25) and did not cry (UOR 3.45, 95% CI 1.76 to 6.78)); newborn's first movement (slowly (UOR 1.60,

95% CI 1.25 to 2.05) and did not move (UOR: 2.03, 95% CI 1.38 to 2.99)); and overall condition of the newborn after birth (UOR 2.08, 95% CI 1.61 to 2.69) (table 2).

### Maternal peripartum factors associated with LIBF

In multivariable logistics regression analysis (table 2), the following maternal factors were revealed to have been associated with LIBF: delivery by NVD assisted with episiotomy/forceps (AOR 2.17, 95% CI 1.44 to 3.27); delivery by C-section (AOR 9.67, 95% CI 7.21 to 12.96); and mothers having health problems during childbirth (AOR 1.61, 95% CI 1.30 to 2.00).

### Neonatal peripartum factors associated with LIBF

From multivariable logistics regression analysis (table 2), the following neonatal factors were found to be associated with LIBF: preterm newborns (AOR 1.39, 95% CI 1.09 to 1.78); newborns who moved slowly immediately after birth (AOR 1.43, 95% CI 1.05 to 1.94); and the newborns whose overall condition was sick shortly after birth (AOR 1.60, 95% CI 1.12 to 2.29).

## DISCUSSION

To our knowledge, this is the first study to explore the association of peripartum maternal and neonatal factors with LIBF in Bangladesh. We identified five peripartum factors associated with LIBF: type of delivery, maternal health problems during childbirth, gestational age, newborn's first movement after birth and newborn's health condition shortly after birth. In this present study, the prevalence of LIBF was 18.5%. According to the WHO assessment on breastfeeding initiation, this percentage is considered as good (0%–29%: poor, 30%–49%: fair, 50%–89%: good and 90%–100%: very good).[26] The prevalence of LIBF in our study is lower than the contemporary Bangladesh Demographic and Health Survey 2011 report (52.9%).[27] Studies revealed that regional differences exist on early initiation of breast feeding in Bangladesh. It has been reported that the prevalence of early initiation of breast feeding is high in the Rangpur division compared with the other seven divisions in Bangladesh, also found higher in rural areas than urban areas.[18] Our study clusters were situated in the rural areas of Rangpur division, which makes the result understandable.

In this study, the prevalence of C-section was 16.2%, which was a little higher than the acceptable rate of C-section (10%–15%) recommended by WHO.[28] We found that the odds of the practice of LIBF were higher among the mothers who underwent C-section and assisted NVD. This finding is consistent with the previous studies in Bangladesh.[17 18] C-sections are performed under general anaesthesia or spinal/regional anaesthesia, and breast feeding just after delivery would be challenging due to detachment of the newborn from the mother immediately after birth, pain after surgery, discomforts in holding the baby and delayed skin-to-skin contact. The majority of the operation theatres in Bangladesh do not have proper breastfeeding facilities. Several studies have confirmed that even if the hospital staff practise standard procedures favouring breast feeding, birth by C-section is a significant barrier to initiation of breastfeeding.[29 30] Nearly all assisted NVDs occur under emergencies. Therefore, it can be challenging to early initiate breast feeding. Studies showed that forceps delivery is associated with more maternal morbidities and neonatal injuries.[31] Both the C-section and assisted NVD pertain to the limitation of maternal mobility, wound pain and positioning difficulties[32]; such limitations may delay the initiation of breast feeding. Besides, neonates born by C-section or assisted NVD have been reported to experience more problems with lactating[33] and reduced suckling ability[34]; all of these consequently influence the LIBF. Our study showed an increased likelihood of LIBF in mothers who had health problems/complications during childbirth. This result echoes the findings of a WHO global survey[35] and a previous study conducted in India.[23] Peripartum complications like antepartum haemorrhage, PPH and obstructed labour are illnesses where mothers required immediate interventions that delay mother–newborn interactions. However, prevention of pregnancy complications and postnatal support for the mothers are essential in promoting the initiation of breast feeding. Intrapartum and early postpartum periods are crucial for every mother's and newborn's lives. Postnatal care guidelines recommended by WHO[36] implementing 'birth preparedness and complications readiness' and the BFHI should be taken into account to reduce maternal and newborn health risks and encourage early initiation of breast feeding.[37 38]

In this present study, the risk of LIBF was higher among the preterm newborns compared with the full-term newborns. Our result is consistent with several studies with similar results; preterm newborns are likely to be at greater risk of LIBF.[34 39 40] Gestational age is a strong predictor of breastfeeding initiation. Naturally preterm newborns are immature, and their immaturity limits the abilities needed for breastfeeding initiation, such as good coordination of suction–deglutition–respiration cycle and sucking reflex.[41] A preterm birth is often a chaotic experience for mothers that increases stress levels.[42] Preterm newborns are often born with conditions that possibly need early resuscitation, separating the newborns from mothers. Skin-to-skin contact shortly after birth is a crucial foundation of breastfeeding initiation. It is known that mothers without immediate physical contact with newborns are under greater stress, which hampers the production of breast milk.[43] Although it is impossible to alter the gestational age, premature neonates should have early skin-to-skin contact. Delivery staff should not impose any unnecessary limitations to initiate breast feeding.

The odds of LIBF were higher among newborns who moved slowly and were sick immediately after birth. It was documented that an altered neonatal movement might be associated with neonatal asphyxia.[44] Neonatal

asphyxia is an emergency condition that requires immediate resuscitation. It is not often recommended to early initiate breast feeding until the newborn's breathing has been established.[45] However, the resuscitation should be done sensibly; each step should be appropriately timed to avoid further delay in breastfeeding initiation. Initiatives like 'Helping Babies Breathe' by the American Academy of Paediatrics can provide timely step-by-step newborn resuscitation procedures, which have shown evidence of improving immediate newborn care in low-resource settings.[46] Regardless of WHO and UNICEF recommendations and the BFHI, the percentage of LIBF in Bangladesh is still high. Thereby, extension and reaccreditation of BFHI and adherence with clinical set-up would enhance breastfeeding outcomes including early initiation and exclusive breast feeding. Mothers should be motivated for regular ANC visits since it is evidenced that mothers who attended ANC three or more times and undergoing breastfeeding counselling were likely to initiate early breast feeding.[23] A feasible approach could be integrating breastfeeding initiation programmes into the primary healthcare (PHC) activities, because PHC activities may fortify breastfeeding initiation behaviour.[47 48] Strong evidence shows that PHC health workers aim to achieve breastfeeding initiation and reduction in neonatal moralities through interventions by providing special support to women with complications during pregnancy.[49]

One of the strengths of our study was that data on breastfeeding initiation and maternal and neonatal peripartum factors were collected within 72 hours of birth from the majority of the mothers (89%) to minimise recall bias. The study was conducted at the community level that makes the study more generalised than a hospital-based study. However, the study had several limitations. Several explanatory variables were recorded based on the mother's response to specific questions, which could be better assessed in the hospital or by health personnel. This cross-sectional study cannot establish a causal relationship between LIBF and intrapartum and neonatal factors.

## CONCLUSIONS

This paper reiterates that successful breastfeeding initiation depends not only on the mother's individual, socioeconomic and cultural characteristics but also on some critical peripartum maternal and neonatal factors. Nearly one-fifth of the mothers delayed the initiation of breast feeding. We recommend that more attention should be given to the reduction of maternal and neonatal complications during childbirth. An introduction of essential package of interventions for safe labour and delivery should be implemented for a successful early initiation of breast feeding.

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