

Original Research Article

CLINICAL PROFILE, MATERNAL FACTORS AND IMMEDIATE NEONATAL OUTCOMES AMONG NEONATES WITH BIRTH ASPHYXIA ADMITTED TO A TERTIARY CARE HOSPITAL IN ASSAM: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: In underdeveloped nations, birth asphyxia continues to be a leading cause of infant illness and mortality. Improving newborn survival requires early detection of variables linked to unfavourable neonatal outcomes. The objective is to determine the parameters linked to newborn activity at delivery and to evaluate the clinical profile, maternal traits, and immediate neonatal outcomes among neonates admitted with birth asphyxia.

Materials and Methods: In a tertiary care hospital in Assam, 42 newborns who were admitted with birth asphyxia participated in a cross-sectional study. Hospital records were used to gather information on maternal features, the neonatal clinical profile, referral status, APGAR scores, and outcomes.

Results: Of the 42 newborns who experienced birth asphyxia, 25 (59.5%) newborns were male, 22 (52.4%) weighed between (2.5 and 4.0 kg) at delivery, and 32 (76.2%) were born at full term. 34(81.0%) were admitted within 24 hours after delivery, and 30 (71.4%) were born at DMCH. 23 (54.8%) pregnant mothers had fewer than four prenatal care visits, and 25 (59.5%) mothers had maternal anaemia. General condition ($p<0.001$), muscle tone ($p<0.001$), cry at birth ($p=0.004$), and the need for resuscitation ($p=0.035$) were all strongly correlated with neonatal activity at birth.

Conclusion: Neonatal activity at birth was significantly influenced by general condition, muscle tone, crying at birth, and the requirement for resuscitation in neonates with birth asphyxia. To improve infant outcomes, early evaluation and timely resuscitation are crucial.

Keywords: Birth asphyxia, Neonates, Assam.

INTRODUCTION

Neonatal asphyxia, also known as birth asphyxia, occurs when a newborn is apnoeic or gasping, and their breathing does not begin for more than 60 seconds after birth. Neurological damage is more likely the longer the delay.

An estimated 56 million deaths occur worldwide each year, with 10.5 million of those deaths occurring in children (almost all in developing nations). About one-fifth of infant deaths are caused by prenatal factors such as delivery trauma and hypoxia, with lower respiratory infections accounting for only a small portion.^[1]

In 2022, an estimated 2.3 million babies died within the first 28 days of life; a large percentage of these deaths were caused by hypoxia and other intrapartum-related occurrences. Despite improvements in neonatal survival worldwide, birth asphyxia is still very common, especially in nations with low and moderate incomes.^[2]

India's newborn mortality rate (NMR) significantly improved over the preceding 20 years, falling from 44 per 1,000 live births in 2000 to 20 per 1,000 live births in 2020.^[3] However, birth asphyxia remains a major cause of infant morbidity and mortality with significant variations both between and within states. Many northeastern states, notably Assam, have

higher rates of newborn and neonatal mortality than the national average. According to NFHS-5 (2019–21), Assam recorded an NMR of 24 per 1,000 live births, which is higher than the national average of 18 in 2024. Persistent hotspots were found in districts like Dhubri.^[4,5] The five factors that make up the Apgar score are appearance, pulse, grimace, activity, and respiration, or APGAR. On a scale of 0 to 10, scores below 3 are regarded as dangerously low in circumstances of the greatest emergency, scores between 4 and 6 are regarded as pretty low, and scores equal to or higher than 7 indicate generally normal levels of the newborn's health. The Apgar score is often less than seven in areas with historically high newborn mortality.^[6]

Several factors, including inadequate newborn practices, delayed transportation, inadequate referral systems, widespread maternal anaemia, and low prenatal care cause poor intrapartum outcomes in this region. Despite handling a large volume of referrals, Dhubri Medical College & Hospital (DMCH), a tertiary referral centre servicing the Dhubri district and adjacent areas, lacks local knowledge on the causes of birth asphyxia.

A comprehensive assessment of sociodemographic, clinical profile, referral, maternal, and neonatal variables is necessary to direct focused therapy. Thus, this study was carried out to examine risk factors for birth asphyxia at DMCH, Dhubri to identify practical strategies to reduce infant morbidity and death in an aspirational region of northeastern India.

MATERIALS AND METHODS

A hospital-based, cross-sectional study was conducted in the Special Newborn Care Unit (SNCU) of Dhubri Medical College and Hospital (DMCH), Dhubri, Assam, a tertiary care centre that serves as a referral hub for both urban and rural populations of Dhubri district and adjoining areas of western Assam, with a high volume of obstetrics referrals from peripheral health institutions. The study population consisted of infants referred from outlying institutions and live-born neonates delivered at the hospital during the study period. The study was carried out over a period of 2 months, from 1st May, 2026 to 30th June, 2026. A total of 42 babies with birth asphyxia were eligible neonates evaluated at random over the course of the period. Data were collected using a structured data collection from the SNCU medical records in the MRD. Newborns with birth asphyxia were classified as cases, if they required positive pressure ventilation or other resuscitation techniques in compliance with hospital protocol, had an Apgar score of less than seven at one minute, and did not cry or breathe on their own right away.

Birth asphyxia, which is operationally defined as the incapacity to initiate or sustain breathing immediately after birth and requiring resuscitation.

Inclusion Criteria:

- All live birth Newborns who had birth asphyxia at DMCH and referred babies with birth asphyxia cases.
- Hospital Admission within 24 hours or beyond >24 hours of Birth at SNCU, DMCH.
- All Preterm (<37 weeks) and Term (>37 weeks) neonates.

Exclusion Criteria:

- Newborns with major congenital malformations.
- Newborns with severe infections (Sepsis).
- Newborns with metabolic disorders that could confound our assessment.

Statistical Analysis: Microsoft Excel was used to enter the data, and SPSS was used for analysis.

Frequencies and percentages were used to convey categorical values.

The mean and interquartile range or the mean and standard deviation were used to summarize continuous data.

Using the chi-square test, we evaluated relationships between categorical factors and neonatal activity at delivery based on anticipated cell frequencies. A p-value of less than 0.05 was regarded as statistically significant.

Records that were missing were reported individually and were not imputed.

Ethical Consideration: The Dhubri Medical College and Hospital's Institutional Ethics Committee will approve prior to the study's start.

Throughout the study, patient data will be kept confidential. Only the study will be conducted using the data.

RESULTS

Socio-demographic Characteristics [Table 1]

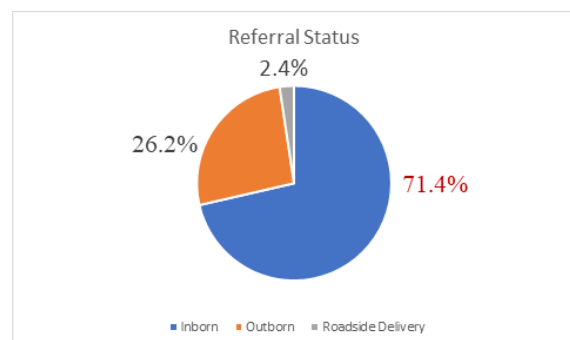
The study included 42 newborns who had been diagnosed with birth asphyxia. The male-to-female ratio was 1.47:1, with 25 (59.5%) of them being men and 17 (40.5%) being women. Most mothers 15(35.7%) were between the ages of 20 and 24 years, followed by 10(23.8%) 25–29 years, while only one mother 1(2.4%), was aged more than 35 years. Most participants were Muslim 30(71.4%). There were data on 36 mothers' ages at marriage. Of all the moms in the study, 22 (52.4%) were married between the ages of (18 -20) years, 8 (19.0%) between the ages of (21 – 25) years, and 6 (14.3%) got married before the age of 18 years. Age at marriage was unavailable for 6 (14.3%) mothers, who were referred from the peripheral centre. 30 (71.4%) neonates were inborn, 11(26.2%) neonates were referred outborn, and 1(2.4%) was due road side delivery (Fig. 1). Antenatal care information was available for 37 ANC mothers. Among the overall study population, 23 (54.8%) mothers had not completed four prenatal ANC visits, only 14 (33.3%) completed four antenatal visits, and records were unavailable for 5 (11.9%) mothers.

Table 1: Socio-demographic and Maternal Characteristics of Study Participants (n=42)

Variable	Frequency (n=42)	Percentage (%)	P- value
Sex (Neonate)			
Male	25	59.5	
Female	17	40.5	
Religion			
Hindu	12	28.6	
Muslim	30	71.4	
Maternal Age (Years)			
15-19	8	19.0	0.979
20-24	15	35.7	
25-29	10	23.8	
30-34	8	19.0	
≥35	1	2.4	
Age at Marriage (Years)			
<18	6	14.3	
18-20	22	52.4	
21-25	8	19.0	
Not recorded	6	14.0	
Referral Status			
Inborn	30	71.4	
Out born	11	26.2	
Roadside Delivery	1	2.4	
Antenatal Care Status			
Inadequate ANC (<4 visits)	23	54.8	
Adequate ANC (≥4 visits)	14	33.3	
Record not available	5	11.9	
Gestational Age			
Pre-Term (<37 weeks)	7	16.7	
Term (37-41.6 weeks)	32	76.2	
Post-Term (>42 weeks)	3	7.1	

Table 2: Maternal Characteristics of Study Participants (n=42)

Variable	Frequency (n=42)	Percentage (%)	P- value
Maternal Weight (Kg)			
40-50	22	52.4	0.313
50-60	15	35.7	
60-70	3	7.1	
70-80	2	4.8	
Gravida			
G2	22	52.4	0.304
G3	11	26.2	
G4	5	11.9	
G5	3	7.1	
G6	1	2.4	
Mode of Delivery			
Vaginal Delivery (NVD)	23	54.8	0.712
Caesarean Section (LSCS)	19	45.2	
Maternal Haemoglobin Status			
Anaemic (Hb <11 g/dL)	25	59.5	0.612
Normal (Hb ≥11 g/dL)	11	26.2	
Record not available	6	14.3	

**Figure 1: Referral Status****Maternal Characteristics [Table 2]**

22(52.4%) Most mothers weighed between 40–50 kg. Gravida 2 constituted the largest group, followed by

gravida 3. Higher-order gravidity (≥4) was observed in a smaller proportion of mothers. 23 (54.8%) were delivered by normal vaginal delivery (NVD), while 19 (45.2%) were delivered by lower segment caesarean section (LSCS). Maternal haemoglobin records were available for 36 mothers. Of the mothers in the study, 25 (59.5%) had anaemia (Hb <11 g/dL), 11 (26.2%) had normal haemoglobin levels (Hb ≥11 g/dL), and 6 (14.3%) did not have haemoglobin records.

Neonatal Characteristics [Table 3]

Among the neonates, 22 (52.4%) had low birth weight (<2.5 kg), whereas 20 (47.6%) had normal birth weight (≥2.5–4.0 kg). Most neonates were born at term gestation. Normal vaginal delivery accounted for 23(54.8%) of deliveries. Most of the neonates

were lethargic 31(73.8%). More than 27(64.3%) of neonates had limp muscle tone. 24(57.1%) of neonates cried at birth, 16(38.1%) were feeble, and 2 (4.8%) neonates did not cry at birth. 22(52.4%) needed resuscitation at birth, though 11 neonates didn't have records due to being referred from a peripheral centre. Most neonates had low APGAR scores at 1 minute, indicating significant neonatal depression immediately after birth. Improvement was observed at 5 minutes following resuscitative measures. 34(81%) born within 24 hours (<1 day) were admitted at SNCU, DMCH, 5 (11.9%) were admitted

after 1 day and 3(7.1%) admitted after 2 days of birth, mostly referred from peripheral centres. Among all the perinatal asphyxia neonates 1(2.4%) neonate was born with cleft lip. 41(97.4) neonates were active and 1(2.4%) were lethargic at the time of discharge.

Factors Associated with Activity at Birth

Statistical analysis demonstrated a significant association between neonatal activity at birth and immediate clinical parameters, including general condition, muscle tone, cry at birth, and requirement for resuscitation.

Table 3: Neonatal Characteristics (n=42)

Variable	Frequency	Percentage	P - Value
Birth Weight			
1.0 – 1.5kg	2	4.8	
1.5 – 2.5kg	18	42.9	0.689
2.5 – 4.0kg	22	52.4	
General Condition			
Alert	11	26.2	<0.001
Lethargic	31	73.8	
Muscle Tone			
Active	15	35.7	<0.001
Limp	27	64.3	
Cry at Birth			
Normal	24	57.1	
Feeble	16	38.1	0.004
Absent	2	4.8	
Resuscitation required			
Yes	22	52.4	
No	9	21.4	0.035
Record not available	11	26.2	
APGAR Score	1 minute	5 minutes	
Severe (0-3)	17	3	
Moderate (4-6)	4	14	
Normal (7 – 10)	0	2	
Record not available	21	23	
Age at Admission			
<1 day	34	81.0	
1 day	5	11.9	
2 days	3	7.1	
Indication of Admission			
Perinatal Asphyxia	41	97.6	
Perinatal Asphyxia with Cleft Lip	1	2.4	
Outcome at Discharge			
Active	41	97.6	
Lethargic	1	2.4	

Table 4: Age at Discharge of Neonates with Birth Asphyxia

Parameter	Value
Mean ± SD	5.83 ± 3.54 days
Median	5 days
Interquartile range (IQR)	4-6 days
Minimum	1 day
Maximum	17 days

The mean duration of hospital stay among neonates with birth asphyxia was 5.83 ± 3.54 days. The median hospital stay was 5 days, with a range from 1 to 17 days.

DISCUSSION

Birth asphyxia remains a significant contributor to newborn death and morbidity in impoverished nations. The present study evaluated the clinical profile, maternal characteristics, and immediate neonatal outcomes among 42 newborns admitted to a tertiary care facility due to birth asphyxia at DMCH. In this study, male neonates constituted 25(59.5%) of cases, which is consistent with previous studies, such

as Soni H et al.'s study of 130 neonates in Gujarat, in which Male neonates were 79 (60.8%). They reported a higher susceptibility of male newborns to adverse perinatal outcomes.^[7] The average age at marriage in this study was 19.08 ± 2.44 years, and most mothers 22(52.4%) got married between 18 and 20 years of age. Furthermore, 6(14.3%) of mothers were married before turning 18 years old, which is higher in this region than in NFHS-6, where only 20.1% (age 20-24 years) married before turning 18 years old in

2023-24.^[3] In many regions of India, early marriage is still prevalent and has been linked to poor outcomes for mothers and newborns, including early childbirth, a lack of educational opportunities, poor use of maternal health care, and an increase in obstetric difficulties. In the current study, age at marriage was noted as a major sociodemographic factor; however, there was no statistically significant correlation found with neonatal activity at birth. Nearly half of the neonates 19(47.6%) had low birth weight (< 2.5 kg), which is much higher compared with the studies by Rahman M et al. in the SNCU of GMCH, Northeast India, Guwahati, Assam, which is 3239(43.5%).^[8] The majority of neonates (71.4%) were born at the institute. In comparison, 26.2% were referred from peripheral health facilities, and one patient (2.4%) was admitted after roadside delivery assistance, highlighting the outstanding importance of establishing a tertiary care hospital. Just 14(33.3%) of the mothers completed ANC checkups at four prenatal care appointments, compared to more than half, 23(54.8%), who had fewer than four antenatal checkups, which is lower than NFHS-6 India, where 65.2% have completed their antenatal visits and only 51.6% in the rural area of Assam. Sufficient prenatal care makes it easier to recognise and treat high-risk pregnancies early on, which lowers the chance of poor newborn outcomes.^[3] The current study's low percentage of mothers who completed the prescribed number of prenatal visits emphasizes the need to increase the use of prenatal care through increased awareness, early registration, and frequent prenatal follow-up. Among them 5(11.9%) neonates who were referred from other hospital did not have proper records, while 16.7% were born preterm which is similar to the study conducted by Wosenu L et al.'s in Ethiopia of which only 11 (6.1%) of the prenatal asphyxia controls and one-fifth (17.8%) of the cases were preterm.^[9] According to Christopher GL., newborns with term gestation 37 weeks and above and premature babies under 37 weeks were at a higher risk OR 1.36 [95% CI 1.03- 1.79], This had a statistical significance of $P=0.032$ for birth asphyxia.^[10] Khound1 M. has similar findings in newborns at 38 weeks of gestation, accounting for 79 cases.^[11]

However, neither birth weight nor gestational age showed a statistically significant association with neonatal activity at birth. Similar observations have been reported in studies where the immediate neonatal condition was more strongly influenced by the severity of hypoxic insult than by demographic characteristics alone. Nearly 25 (59.5%) of mothers in the current study had maternal anaemia, making it a frequent condition. Maternal anaemia has been linked to a decreased ability to carry oxygen, which could lead to fetal hypoxia and unfavourable postnatal outcomes. However, the association between maternal anaemia and newborn outcomes should be regarded with caution because haemoglobin values were missing for 6(14.3%) of mothers and the study had a small sample size.

Nearly half of the neonates 19(47.6%) had low birth weight (< 2.5 kg), which is much higher compared with the studies by Rahman M et al. in the SNCU of GMCH, Northeast India, Guwahati, Assam, which is 3239(43.5%).^[8] and, Aslam et al in his case-control study, who discovered a significant correlation between birth weight and birth asphyxia, with babies born weighing between 1 and 2 kg having a higher risk of birth asphyxia.^[12]

31(73.8%) of patients were found lethargic due to perinatal asphyxia at birth, mainly among outborn neonates, which is significant in our study, and 27(64.3%) of neonates had limp muscle tone, which is also significant in our study. In contrast, 24 (96.3%) of the participants in the Sinha AA research had aberrant tones.^[13] Most neonates, 31(81.0%) were admitted during the first 24 hours of life, highlighting the need for timely access to neonatal care. The average length of hospital stay in this study. Following appropriate neonatal resuscitation and supportive care, the majority of newborns were discharged within the first week of life, showing favourable short-term recovery. A few newborns, however, needed to stay in the hospital for up to 17 days, probably due to more severe clinical conditions or related neonatal problems, which is comparable to the research by Singh S et al., where the majority of patients stayed for a week (1- days) for better outcomes out of 1052 neonates.^[14]

41(97.6%) of neonates were discharged in an active condition, with no mortality, suggesting favourable short-term outcomes following appropriate neonatal management, which is higher in comparison to the study done by Jogi MS et al., where the Successful discharge rate is 186 (85%) and 31(14.3%) deaths during hospital stay.^[15] According to Lee ACC et al., thirty per cent of neonatal deaths were due to birth asphyxia (9.7/1000.0 live births), whereas no mortality occurred during our study, which also supports the importance of SNCU at peripheral medical college.^[16]

One of the study's main conclusions was the substantial correlation between activity at birth and immediate clinical parameters. General condition ($p<0.001$), muscle tone ($p<0.001$), cry at birth ($p=0.004$), and requirement of resuscitation ($p=0.035$) were significantly associated with neonatal activity at birth. These findings are clinically expected, as depressed tone, poor cry, and need for resuscitation are recognised manifestations of perinatal hypoxia and important indicators of birth asphyxia severity.

Maternal age, maternal weight, gravida, mode of delivery, fetal distress, meconium-stained liquor, APGAR scores, and referral status did not demonstrate statistically significant associations with neonatal activity at birth. The absence of significant associations may be attributable to the relatively small sample size and limited statistical power of the study.

The findings underscore the importance of prompt neonatal assessment and resuscitation immediately

after delivery. Early identification of neonates with poor general condition, abnormal muscle tone, and absent or weak cry may facilitate timely intervention and improve neonatal outcomes.

The single-center design, small sample size, and absence of a comparison group were the study's limitations. It is advised that further multicentric studies with bigger sample sizes be conducted to more thoroughly assess the maternal and perinatal factors that contribute to birth asphyxia and their effects on neonatal outcomes.

CONCLUSION

The present study demonstrated that immediate neonatal clinical parameters, namely general condition, muscle tone, cry at birth, and requirement for resuscitation, were significantly associated with neonatal activity at birth among newborns admitted with birth asphyxia. Maternal demographic factors and obstetric characteristics did not exhibit statistically significant associations. Prompt neonatal assessment and timely resuscitation remain crucial for improving early neonatal outcomes in birth asphyxia.

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