# Morbidity Pattern and Association of Hospital Stay with the Outcome of Severely Asphyxiated Newborn in a Tertiary Care Hospital

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## Abstract

**Background:** Perinatal asphyxia is a prime causality of death and disability among newborns in less developed countries like Bangladesh. Few studies were made to report information on this neonatal situation in our country because of limitations. It aims to assess clinical problems and associated hospital stays concerning outcomes in severely asphyxiated babies.

**Materials and methods:** It was a cross-sectional study, done in the Neonatal Ward, Department of Pediatrics, Chittagong Medical College Hospital, Chattogram from 1stDecember 2013 to 31st May 2014. This study includeda totalof 100 asphyxiated newborns. All the relevant data were evaluated,compiled and statistical analyses were done.

**Results:** Out of 100 neonates, the ratio of male (66%) and female (34%) was 1.9:1. 60% of babies were admitted to this hospital within 12 hours of age. Most of the babies admitted were not born in this hospital (66%). More than half of neonates were born by Lower Uterine Caesarian Section (LUCS)(54%). Among them, preterm deliveries were 36% and Low Birth Weight (LBW) neonates were 48%. This study showed various morbidities in studied cases, in which Hypoxic Ischemic Encephalopathy (HIE) was most common (78%) and others were respiratory distress (30%), convulsion (26%) included HIE and other causes like hypoglycemia, hypocalcemia, septicemia (22%), apnea (18%), feeding intolerance (14%) excluding Necrotizing Enterocolitis (NEC) and due to other causes like septicemia, NEC (10%), hyperbilirubinemia (8%). Out of 100 neonates 38 (38%) died. In this study, most of the deaths were associated with LBW (63.2%), prematurity (47.4%), HIE (89.5%) respiratory distress (30%) and sepsis (22%). This study showed that 90.3% of newborns stayed in the hospital for 1-2 weeks among the survivors. The majority (42.1%) of deaths were within 1st week.

**Conclusion:** Among the serious neonatal complications, HIE was the most common in asphyxiated neonates, and mortality was higher in neonates with HIE. Besides neurological manifestations, respiratory distress, and septicemia, apnea is also a major contributor to the morbidity as well as associated mortality of severely asphyxiated babies. Adequate antenatal, intrapartum, and neonatal care with the use of sophisticated technology will improve the neonatal outcome.

**Key words:** Hospital stay; Morbidity; The outcome; Perinatal asphyxia.

## Introduction

Birth asphyxia is defined by the World Health Organization as "The failure to initiate and sustain breathing at birth".[1] According to World Health Organization estimates, in developing countries, 3% of all infants suffer from moderate to severe birth asphyxia, of which 23% die and approximately the same number develop serious sequelae.[2]

Considering all of our constraints and in resource-poor countries assessment of fetal or neonatal acidemia is not possible and therefore perinatal asphyxia was considered when there was a history of failure or delayed onset of spontaneous respiration after birth or when a baby needed positive pressure ventilation for more than one minute.[3] As the incidence of HIE is significantly higher in developing countries, this may present heavy social and economic costs.[4]

Many pathological, biochemical, and metabolic changes occur as a result of birth asphyxia. The subsequent effect affects many organ systems like the central nervous system, cardiovascular systems pulmonary, renal, and adrenal. gastrointestinal skin and hemopoietic system. Cerebral complications are the most devastating as full recovery may not occur and the child may develop neurological sequelae.[3]

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Despite improvements in obstetric and neonatal care, the incidence of birth asphyxia is similar among developing countries. The neonatal mortality is a little bit decreased but morbidity after birth asphyxia-in-the form of neurologic damage is the same or even increased due to survival of asphyxiated babies.[5,6]

The major consequence of perinatal asphyxia is Hypoxic Ischemic Encephalopathy (HIE). The diagnosis of HIE requires abnormal findings on neurological examination the day after birth. Infants can progress from mild to moderate and/or severe encephalopathy over 72 hours following the hypoxic-ischemic insult.[7] The terms 'perinatal asphyxia' and 'HIE' are often inappropriately used to define the same pathology.[8]

Severe HIE (Sarnat stage-III) carries a mortality rate of 80% and survivors often have multiple disabilities, including spastic cerebral palsy, severe or profound mental retardation, cortical blindness, and seizure disorder.[9] The frequency of neurodevelopmental sequelae in surviving asphyxiated infants is approximately 15% to 45%.[10]

Infants with HIE secondary to perinatal asphyxia have a very high mortality. Among the survivors, over 25% have neurological deficits.[11]. In this study, we will try to evaluate and observe clinical problems indicating morbidity and associated mortality patterns of severe perinatal asphyxia in the context of the present situation in Bangladesh which will help to improve the future management outcomes. The prime objective of the study is toassess the clinical problems and associated hospital staysconcerningoutcomes in severely asphyxiated babies.

**Materials and methods**

It was a cross-sectional study, done in the Neonatal Ward Department of Pediatrics, Chittagong Medical College Hospital, Chattogram from 1st December 2013 to 31stMay 2014. This study included a total of 100 asphyxiated newborns. Data was taken by a non-probability convenient sampling technique.

Perinatal asphyxia was considered when there was a history of failure or delayed the onset of spontaneous respiration after birth or when a baby needed positive pressure ventilation tur more than one minute.

No data or any information will be collected without the permission of the patient. Participation in this research will be fully voluntary. The respondents will remain entirely free to withdraw their participation at any stage or at any time in the study. Written informed consent will be taken from each patient. Before consent, they will be explained the aim and purpose of the research. Confidentiality will be assured and anonymity will be maintained, no participants will be identified in any report or publication under this study.

After obtaining informed written consent from the patient attendant all emergency and necessary measures were taken when the patient's condition was stable, detailed history and a face-to-face interview were taken and diagnosis was made based on history and physical examination.

Severely asphyxiated newborns attending the neonatal ward of Chittagong Medical College Hospital up to 48 hours of age are included. Perinatal asphyxia associated with sepsis, Infant of diabetic mothers, MAS, multiple congenital anomalies, and very low birth weight babies are excluded from the study.

Babies were followed up twice daily. The note was kept for pallor, cyanosis, and jaundice. apnea, respiratory distress, the level of consciousness, convulsion, muscle tone, feeding, abdominal distension, or GI bleeding. Management was given according to the protocol of the unit.

All data were collected in pre-determined case record forms containing different ID numbers. Data was presented as the percentage of total observation. SPSS v. 18 for windows were used for analysis of data. A chi-square test was done to find out the correlation. $p < 0.05$ was used as the minimum level of significance. For this study, necessary permission was obtained from the proper authorities.

**Results**

In our study, out of 100 neonates, the ratio of males (66%) and females (34%) was 1.9:1. 60% of babies within 12 hours of age were admitted to this hospital. Most of the babies were not born in this hospital (66%). More than half of neonates were born by Lower Uterine Caesarian Section (LUCS) (54%).

This study showed various morbidities in studied cases, in which Hypoxic Ischemic Encephalopathy (HIE) was most common (78%) and accounted for 89.5% of the total deaths which was statistically significant. Here the other morbidities were respiratory distress (30%), convulsion (26%) included HIE and other causes like hypoglycemia, hypocalcemia, septicemia (22%), apnea (18%), feeding intolerance (14%) excluding Necrotizing Enterocolitis(NEC) and due to other causes like septicemia, NEC (10%), hyperbilirubinemia (8%) which were significantly associated with mortality.

Among the 100 neonates, 38 (38%) died. In this study, most of the deaths were associated with LBW (63.2%), prematurity (47.4%), HIE (89.5%) respiratory distress (30%), and sepsis (22%).

This study showed that among the survivors 90.3% of newborns stayed in the hospital for 1-2 weeks. The majority (42.1%) of deaths were within 1st week. The mean duration of hospital stay was 10.68 days, SD 4.29, median 11.00, and range 1-21 days.

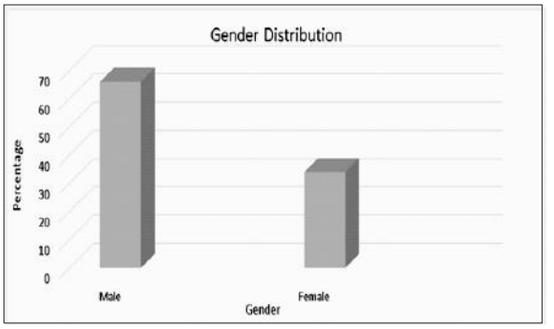


**Figure 1** Gender distribution of study subjects (n=100) (Male=66, Female=34)

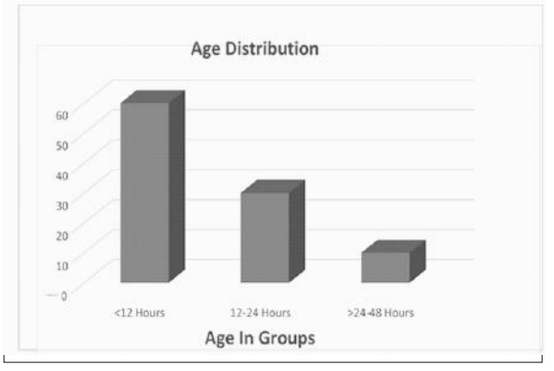


**Figure 2** Distribution of age of the asphyxiated newborn (n=100)

**Table I** Distribution of clinical problems (Morbidities) among the study subjects (n =100)

| Clinical Problems | | Frequency | Percentage (%) |
|---|---|---|---|
| Hypoxic Ischemic | Present | 78 | 78.0 |
| Encephalopathy (HIE) | Absent | 22 | 22.0 |
| Respiratory Distress | Present | 30 | 30.0 |
| | Absent | 70 | 70.0 |
| Convulsion | Present | 26 | 26.0 |
| | absent | 74 | 74.0 |
| Septicemia | Present | 22 | 22.0 |
| | Absent | 78 | 78.0 |
| Apnea | Present | 18 | 18.0 |
| | Absent | 82 | 82.0 |
| Feeding Intolerance | Present | 14 | 14.0 |
| | Absent | 86 | 86.0 |
| Necrotizing | Present | 10 | 10.0 |
| Enterocolitis | Absent | 90 | 90.0 |
| Jaundice | Present | 08 | 8.0 |
| | Absent | 92 | 92.0 |
| Total | | 100 | 100.0 |

Cases of convulsion included HIE and other causes like hypoglycemia, and hypocalcemia. This table shows that Hypoxic Ischemic Encephalopathy was the most common (78%) clinical problem among 100 asphyxiated cases. Others were respiratory distress (30%), convulsion (26%), septicemia (22%), apnea (18%), feeding intolerance (14%), necrotizing enterocolitis (10%) and jaundice (8%) were also found in this study (Table I).

**Table II** Association between clinical problems (Morbidities) and the outcome of severe PNA (With $\chi^2$: test significance)

| Morbidities | | Outcome | | | | Total | | |
|---|---|---|---|---|---|---|---|---|
| | | Recovered | | Death | | | | |
| | | n | % | n | % | n | % | $\chi^2$ test Significance |
| HIE | Present | 44 | 71.0 | 34 | 89.5 | 78 | 78.0 | $p = 0.030^S$ |
| | Absent | 18 | 29.0 | 4 | 10.5 | 22 | 22.0 | |
| Respiratory Distress | Present | 14 | 22.6 | 16 | 42.1 | 30 | 30.0 | $p = 0.039^S$ |
| | Absent | 48 | 77.4 | 22 | 57.9 | 70 | 70.0 | |
| Convulsion | Present | 12 | 19.4 | 14 | 36.8 | 26 | 26.0 | $p = 0.053^{NS}$ |
| | Absent | 50 | 80.6 | 24 | 63.2 | 74 | 74.0 | |
| Septicaemia | Present | 6 | 9.7 | 16 | 42.1 | 22 | 22.0 | $p = 0.000^{HS}$ |
| | Absent | 56 | 90.3 | 22 | 57.9 | 78 | 78.0 | |
| Apnoea | Present | 4 | 6.5 | 14 | 36.8 | 18 | 18.0 | $p = 0.000^{HS}$ |
| | Absent | 58 | 93.5 | 24 | 63.2 | 82 | 82.0 | |
| Feeding Intolerance | Present | 10 | 16.1 | 4 | 10.5 | 14 | 14.0 | $p = 0.433^{NS}$ |
| | Absent | 52 | 83.9 | 34 | 89.5 | 86 | 86.0 | |
| NEC | Present | 4 | 6.5 | 6 | 15.8 | 10 | 10.0 | $p = 0.131^{NS}$ |
| | Absent | 58 | 93.5 | 32 | 84.2 | 90 | 90.0 | |
| Jaundice | Present | 8 | 12.9 | 0 | 0.0 | 8 | 8.0 | $p = 0.021^S$ |
| | Absent | 54 | 87.1 | 38 | 100.0 | 92 | 92.0 | |

S = Significant ($p < 0.05$), NS = Not Significant ($p > 0.05$), HS = Highly Significant ($p < 0.001$).

Cases of convulsion included HIE and other causes like hypoglycemia, and hypocalcemia. Cases of feeding intolerance included other causes like septicemia excluding NEC. This table showed that HIE was the most common (78%) morbidity in the asphyxiated cases and accounted for 89.5% of the total deaths which was statistically significant. Here the other morbidities developed like respiratory distress 30% (Mortality42.1%), Septicemia, apnea, and jaundice which were significantly associated with mortality (Table II).

**Table III** Association between hospital stay and the

| Hospital Stay In Groups | Outcome | | | | Total | |
|---|---|---|---|---|---|---|
| | Survivor | | Death | | | |
| | n | % | n | % | n | % |
| 0-I Week | 02 | 3.2 | 16 | 42.1 | 18 | 18.0 |
| 1-2 weeks | 56 | 90.3 | 12 | 31.6 | 68 | 68.0 |
| 2-3 Weeks | 04 | 6.5 | 10 | 26.3 | 14 | 14.0 |
| | 62 | 100.0 | 38 | 100.0 | 100 | 100.0 |

$\chi^2$ value = 38.382. p = 0.000. Very Highly Significant.

This table showed the statistically highly significant difference between survivors and the death group about hospital stay(p<0.00). Here survivors stayed in the hospital for 1-2 weeks while in death groups, no such variation in hospital stays. The majority (42.1%) of deaths were within 1st week (Table III).

**Table IV** Statistics of duration of hospital stay

| Hospital Stay (Days) | n | MEAN | SD | MEDIAN | RANGE |
|---|---|---|---|---|---|
| | 100 | 10.68 | 4.29 | 11.00 | 1-21 |

The mean duration of hospital stay was 10.68 days, SD 4.29, median 11.00 and range l-21 days (Table IV).

**Discussion**

In this study, the male-to-femaleratio was approximately 1.9: 1. The predominance of male sex in perinatal asphyxia in this study is probably due to male children being given more importance in most of the families in our country. Similar male preponderance is also noted in other studies.[3,12]

In this study mean age of the babies on admission was 12.9 hours; around 60% of asphyxiated babies were admitted to the neonatal ward within 12 hours of age. A study conducted in Bangladesh, reveals that the mean age of babies on admission was 13.8 hours in the asphyxiated group and 2.6 days in the control group, while the Indian study has shown that 71.6% of babies arrived at <24 hours, 24% between 24 to 72 hours and the rest >72 hours of age.[3,13]The difference is that other studies had included all neonatal admissions while our study was based on only asphyxiated babies.

Studied cases showed various neurological manifestations out of them encephalopathy was the most common (78%). Besides this, other manifestations included respiratory distress (30%), convulsion included HIE and other causes (26%), septicemia (22%), and apnea (18%). feeding intolerance due to other causes excluding NEC like septicemia (14%) and hyperbilirubinemia (8%) where other studies showed Hypoxic-Ischemic encephalopathy (HIE) 45%, covulsion31%, jaundice 20%, Septicemia 16%, repeated apnea 16%, respiratory distress 10%. necrotizing enterocolitis 7%, feeding intolerance 6%.[3]

It was observed in this study, that the commonest causes of death were LBW (63.2%), prematurity (47.4%), HIE (89.5%), respiratory distress (30%), and sepsis (22%). Though this type of study on clinical problems of severely asphyxiated newbornsis limited, the findings are more or less similar to the findings of other studies conducted both in our country as well as in other developing countries.[3,14]

Comparable observations were made by Singh and Chowdhury who found a mortality of 44% and 40% respectively in cases of perinatal asphyxia.[15,16] The mortality rate among the admitted severe birth asphyxiated cases was 25.87% which was found in a recent hospital-based study in Bangladesh by Haidery et al.[17] In this study it was found that the death rate in severe birth asphyxia was 38% which was nearly similar to the other studies.[18]

This study showed that among the survivors 90.3% of newborns stayed in the hospital for 1-2 weeks while in death groups, the majority (42.1%) died within the 1ST week of hospital stay which was statistically highly significant.

Perinatal asphyxia is a leading factor contributing to perinatal and neonatal mortality, reflecting a community's social, educational, and economic standards. Its incidence is very high in developing countries like Bangladesh where health facilities are restricted to urban areas and only a small population is getting benefits. Since it is a preventable problem. So, it is better to avoid it at first or if it occurs at all, timely interventions &and appropriate management are necessary. Morbidity and mortality are much higher than is presented in the literature as underreporting is one major factor.

**Limitation**

This was a single-centered study with small samples. Moreover, the study was conducted in a very short time. Therefore, the findings of this study may not reflect the exact scenario of the whole country.

**Conclusion**

Birth asphyxia is one of the most common causes of neonatal deaths and also a major cause of neonatal admission. Among the serious neonatal complications HlE was commonest in asphyxiated neonates and mortality was higher in neonates with HIE. Besides neurological manifestations, respiratory distress, and septicemia, apnea is also a major contributor to the morbidity as well as associated mortality of severely asphyxiated babies. Though neonatal care services have improved over the last 3decades in our country, adequate antenatal, intrapartum, and neonatal care with the use of sophisticated technology will improve the neonatal outcome.

**Recommendation**

Large multi-centered further studiesare recommended.

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**Contribution of authors**

RI-Conception, acquisition of data, data analysis, manuscript writing and final approval.
MU-Data analysis, interpretation of data, critical revisions and final approval.
AMMRK-Interpretation of data, manuscript writing and final approval.
MEH-Interpretation of data, manuscript writing, drafting and final approval.
RI-Data analysis, drafting and final approval.
MRK-Design, critical revisions and final approval.

**Disclosure**

All the authors declared no competing interest.

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