Orginal Article

Clinical Profile and Outcome of Newborn with Perinatal Asphyxia in a Tertiary Center

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Introduction: Perinatal asphyxia is a critical condition that contributes to neonatal morbidity, and mortality, particularly in low-resource settings. Long-term neurodevelopmental impairments and hypoxic-ischemic encephalopathy are associated with perinatal asphyxia. The purpose of this study was to assess the clinical profile and outcome of newborns with perinatal asphyxia.

Methods: A hospital-based descriptive cross-sectional study design was conducted in the neonatal intensive care unit of KIST Medical College and Teaching Hospital. A total of 73 consecutive asphyxiated newborns with or without HIE and admitted to Neonatal Intensive Care Unit in KIST Medical College and Teaching Hospital from Jan 2017- Jan 2022 were selected. Data on maternal, perinatal, and neonatal factors were collected and analyzed to identify determinants and outcomes of perinatal asphyxia. Baseline characteristics of patients were evaluated using descriptive statistics. Categorical variables were expressed in frequency and percentage (%). Neonatal outcome and their association with hypoxic-ischemic staging were analyzed through a chi-square test.

Results: The Apgar score of the asphyxiated newborns at 1 minute of birth was less than six (56.1%), and at 5 minutes of birth, the Apgar score of the 37.8% newborns was more or equal to 6. The majority of the newborns (12.2%) had meconium-stained amniotic fluid while 6.1% of the mothers experienced premature rupture of membranes. Hypoxic-ischemic encephalopathy grade 1, 2, and 3 was diagnosed among 6.1%, 13.4%, and 12.2% of the newborns respectively. About 69.5% of the newborns had improved status.

Conclusion: The challenge of perinatal asphyxia remains a major concern in neonatal care in Nepal. Quality of antenatal care should be enhanced to identify and manage risk factors associated with perinatal asphyxia.

Keywords: *Hypoxic-ischemic encephalopathy, neonatal morbidity, newborn, perinatal asphyxia*

Introduction

Perinatal Asphyxia is a well-known clinical condition concern among neonatologists and obstetricians. It is a significant cause of neonatal mortality and morbidity, contributing to 900,000 deaths each year.[1] About 4 million babies die during the neonatal period, with approximately 99% of these neonatal deaths in developing countries where perinatal asphyxia contributes to almost 23% of deaths.[2]

The American College of Obstetricians and Gynecologists and the American Academy of Pediatrics assign a neonate to be asphyxiated if the

following conditions are fulfilled: Umbilical cord arterial pH <7; an Apgar score of 0-3 for longer than 5 minutes; neurological manifestations (e.g., seizures, coma, or hypotonia); and multisystem organ dysfunction, involving cardiovascular, gastrointestinal, hematological, pulmonary or renal system.[3,4] Placental insufficiency in the antepartum or intrapartum periods is the primary cause of Asphyxia in term infants, with postpartum causes being secondary to pulmonary, cardiovascular, or neurological abnormalities.[5] Although with recent advances in medicine, the mortality rate is on a falling trend, the morbidity in the form of permanent neurodevelopmental complications like cerebral palsy, mental retardation, and epilepsy are increasing.[6] Considering these aspects, this study was conducted to find out the clinical profile of asphyxiated newborns. The study has been designed to assess the prevalence and determinants of perinatal Asphyxia in our tertiary care center and assess neonatal outcomes at discharge. With a better understanding of the associated factors of perinatal Asphyxia, it may be helpful to reduce the incidence of perinatal asphyxia, thus decreasing neonatal mortality and reducing the disability caused by long-term sequelae on affected babies.

Methods

A descriptive cross-sectional study design was conducted in the neonatal intensive care unit (NICU) of KIST Medical College and Teaching Hospital. A Newborn diagnosed with perinatal Asphyxia with or without HIE and admitted to NICU in KIST Medical College and Teaching Hospital from Jan 2017- Jan 2022 was selected.

This study followed a non-probability sampling technique. A total of 73 consecutive asphyxiated newborns from January 2017 to January 2022 who met the inclusion criteria were included in this study. Apgar score less than 7 at 5 minutes of life after resuscitation was considered as an inclusion criterion while newborns with several conditions that could alter the diagnostic indices for perinatal asphyxia were excluded from the study. These included preterm less than 34 weeks of gestational age; newborn babies with a low birth weight of less than 1.5 kg; neonates with significant congenital anomalies, i.e., congenital heart disease, hydrops fetalis, and congenital and chromosomal anomalies; and clinically suspected metabolic disorders.

Data were recorded on a pre-designed proforma and entered into IBM-SPSS version 16. All the data were recorded safely in the medical record department and data were taken and entered into a pre-designed proforma. Baseline characteristics of patients were evaluated using descriptive statistics. Categorical variables were expressed in frequency and percentage (%). Neonatal outcome and their association with hypoxic-ischemic staging were analyzed through the chi-square test. A p-value of <0.05 was taken as statistically significant.

Results

Seventy-three neonates were included in the analysis. The background and obstetric characteristics of the asphyxiated newborns admitted to the hospital are presented (Table 1).

Table 1: Background and Obstetric Characteristics of the asphyxiated Newborns (N=73)

Indicators	Frequency	Percent (%)
Sex		
Male	31	42.5
Female	42	57.5
Parity		
Primipara	50	68.5
Multipara	23	31.5
Gestational Age		
34-36 Weeks	3	4.1
37-41 Weeks	66	90.4
>41 Weeks	4	4.9
Mode of birth		
Vaginal	49	67.1
Instrumental	3	4.1
Cesarean Section	21	28.8
Birth Weight (Grams)		
> 1500 - <2500	10	13.7
2500 - <4000	61	83.6
≥4000	2	2.7
Apgar Score at 1 minute*		
<6	42	57.5
≥6	3	4.1
Apgar Score at 5 minutes*		
<6	17	23.3
≥6	28	38.4
Place of Delivery		
Within Hospital	71	97.3
Outside Hospital	2	2.7

*Missing information

Among the population, there were 42 (57.5%) female newborns and 31(42.5%) male newborns. The mothers of the newborns had a higher parity in terms of primiparity 50(68.5%) followed by multiparty 23(31.5%).

In terms of gestational age at birth, the majority of the newborns were at term gestation 66(90.4%), which is 37-41 weeks, followed by more than 41 weeks 4(4.9%) and 34-36 weeks 3(4.1%) respectively. The majority of the newborns were delivered through spontaneous vaginal delivery

49(67.1%), followed by Cesarean Section 21(28.8%), and instrumental delivery 3(4.1%).

Majority of the newborn 61(83.6%) had a birth weight of 2500 to below 4000 grams, followed by 10(13.7%) more than 1500 to below 2500 grams, and more than or equal to 4000 grams by 2(2.7%).

The Apgar score of the asphyxiated newborns at 1 minute of birth more than or equal to six was 3(4.1%) and less than six was 42(57.5%). At 5 minutes of birth, the Apgar score of the newborns more or equal to 6 was 28(38.4%) and less than six was 17(23.3%). The majority of the newborns 71(97.3%) were delivered at the same hospital, while only 2(2.7%) were delivered at an outside facility.

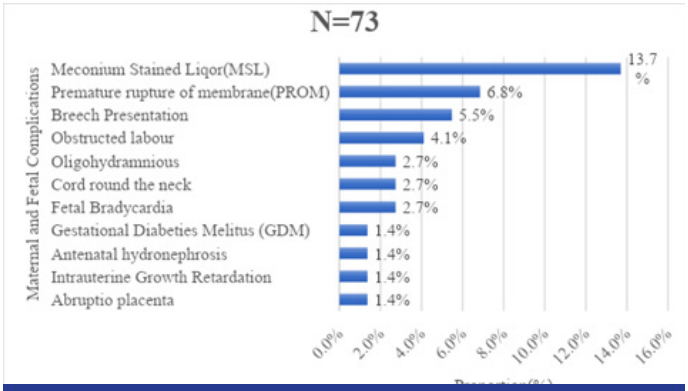

Figure1: Maternal and fetal complications

The maternal and fetal complications of the asphyxiated newborn as shown in Figure 1. The majority of the newborns (13.7%) had meconium-stained amniotic fluid. (6.8%) of the mothers experienced premature rupture of membranes (PROM). Other complications included breech presentation (5.5%), obstructed labor (4.1%), oligohydramnios (2.7%), cord round neck (2.7%), and fetal bradycardia (2.7%). Additionally, gestational diabetes mellitus, antenatal hydronephrosis, intrauterine growth retardation, and abruptio placenta each occurred in 1.4% of the mothers.

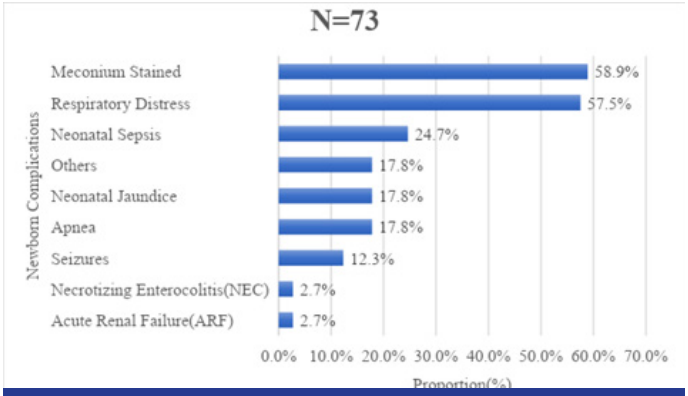

Figure 2: Diagnosis of the asphyxiated newborns

The diagnosis of the asphyxiated newborns is displayed in the figure 2. The majority of the newborns 58.9% were meconium stained, followed by 57.5% having respiratory distress, 24.7% with neonatal sepsis, and 17.8% with other conditions such as neonatal jaundice and apnea. 12.3% of the newborns had neonatal seizures, while 2.7% had necrotizing enterocolitis and acute renal failure.

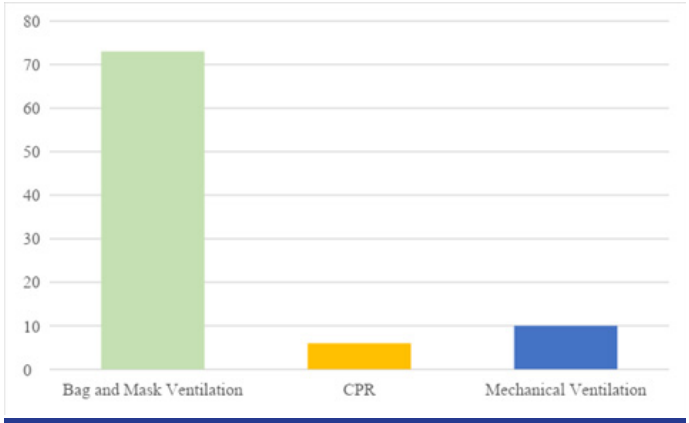

Figure 3: Maternal and fetal complications

Figure 3: Figure 3 displays the resuscitation procedures that were applied as interventions for the asphyxiated newborns. Overall, all of the admitted newborns received bag and mask ventilation 73(100.0%). Additionally, 6 (8.2%) of the newborns received CPR, while 10(13.7%) of the newborns also received mechanical ventilation during the procedure.

Table 2: Status of Hypoxic-Ischemic Encephalopathy (HIE) among the asphyxiated newborns

Hypoxic-ischemic encephalopathy (HIE)	Frequency	Percent (%)
No	50	68.5
Grade 1	5	6.8
Grade 2	10	13.7
Grade 3	8	11.0
Total	73	100

The table presents the status of hypoxic-ischemic encephalopathy (HIE) among the asphyxiated newborns. The majority of the newborns 50(68.5%) showed no signs of HIE. 10 newborns (13.7%) were diagnosed with HIE grade 2, followed by 8 (11.0%) with HIE grade 3, and 5 (6.8%) were diagnosed with HIE grade 1.

Table 3: Discharge outcome of the asphyxiated newborns.

Outcome of Newborns	Frequency	Percent (%)
Improved	52	71.2
Died	4	5.5
LAMA*	11	15.1
Referred	6	8.2
Total	73	100

*Leave against medical advice

Table 3 presents the discharge outcome of the asphyxiated newborns from the hospital. Newborns having an improved status 57(71.2%) were higher among the population which was followed by leaving against the medical advice 11(15.1%) while 6(8.2%) of the newborn were referred to other facility for higher care and 4(5.5%) of the population had neonatal mortality.

Table 4: Association of obstetric characteristics and outcome with status of Hypoxic-ischemic encephalopathy (HIE) among the asphyxiated newborns.

Indicators	Hypoxic-ischemic encephalopathy (HIE)		P-value
	No	Yes	
Sex			0.099
Male	18(36.0%)	13(56.3%)	
Female	32(64.0%)	10(43.5%)	
Gestational Age			0.458
34-36 Weeks	3(6.0%)	0(0.0%)	
37-41 Weeks	44(88.0%)	22(95.7%)	
>41 Weeks	3(6.0%)	1(4.3%)	
Mode of delivery			0.177
Vaginal	32(64.0%)	17(73.9%)	
Instrumental	1(2.0%)	2(8.7%)	
C-Section	17(34.0%)	4(17.4%)	
Birth Weight			0.847
1500 to 2400 grams	7(14.0%)	3(13.0%)	
2500 grams to 3900 grams	42(84.0%)	19(82.6%)	
≥4000 grams	1(2.0%)	1(4.3%)	
Duration of stay			0.003
< 1 days	2(4.0%)	6(21.7%)	
1 to 7 days	40(82.0%)	10(43.5%)	
>7 days	7(14.0%)	8(34.8%)	
Outcome			0.045
Improved	39(78.0%)	13(56.5%)	
Died	1(2.0%)	3(13.0%)	
LAMA*	8(16.0%))	3(13.0%)	
Referred	2(4.0%)	4(17.4%)	

Pearson Chi-Square Test, *Leave against medical advice

Table 4, shows the association of obstetric characteristics and outcomes with the status of Hypoxic-ischemic encephalopathy (HIE) among the asphyxiated newborns. It was found that newborns with HIE status tended to have a longer hospital stay, with 8 (34.8%) staying more than 7 days, $p<0.05$. Moreover, the outcome at discharge from the hospital was also associated with HIE status, as 13.0% of the newborns with HIE had mortality, and 17.4% were referred for higher care, compared to newborns without HIE status, $p<0.05$. The other indicators such as sex, gestational age, birth weight and mode of delivery had no significant association with HIE status.

Discussion

Perinatal Asphyxia is a significant cause of mortality and morbidity among newborns. It is a leading neonatal problem requiring admission and provision of NICU care.[7] Although many recent advances have significantly improved the outcome in case of birth asphyxia, it is still a significant burden on the economic and emotional aspects of parents and care providers. In one hospital-based study in Nepal, birth asphyxia accounted for 24% of the perinatal mortality rate. It is high compared to other developed countries, highlighting the lack of availability of treatment advancements in our part of the world. Another critical obstacle is the gold standard operational definition of perinatal Asphyxia. Different guidelines have different definitions, which has resulted in various studies showing a wide range of perinatal asphyxia incidences, like 9.3% to 25% in different studies.[8,9,10,11]

In the present study, the Apgar score of the asphyxiated newborns at 1 minute of birth was more than six in (4.1%), and 57.5% at 6 minutes of birth. Another study revealed that, in the first and fifth minutes, 88% and 95% of the neonatal APGAR scores were more than seven, respectively.[12] The majority of the newborns (13.72%) had meconium-stained amniotic fluid. The proportion was higher (24.6%) in the study conducted in Ethiopia.[13] About 6.8% of the mothers experienced premature rupture of membranes (PROM). In a study, 12.1% of the participants in the control group had a history of PROM.[14]

The majority of the newborns (58.9%) were meconium stained in this study. However, the prevalence was found to be lower (13.37%) in another study.[15] Present study depicted that 24.7% with neonatal sepsis. A similar finding was identified which showed 51.6% had neonatal sepsis.[16] About 57.5% having respiratory distress was identified in newborns. However, the case of respiratory distress was low (4.6%) in another hospital-based study.[17] Conditions such as neonatal jaundice were prevalent among 17.8% of the newborns. This prevalence was low as compared to the study conducted in Nepalgunj (39.85%).[18] Overall, all of

the admitted newborns received bag and mask ventilation. However, the study conducted in Madhesh Province showed less than half (44.44%) of babies received bags and masks.[19]

The majority of the newborns (68.5%) showed no signs of HIE while (13.7%) were diagnosed with HIE grade 2, followed by (12.2%) with HIE grade 3, and (6.8%) were diagnosed with HIE grade 1. Similar findings were identified where a majority (61.6%) were presented without HIE, 10.4% were diagnosed with HIE I, 24% with HIE II, and 4% with HIE III.[20] Study conducted in Saudi Arabia showed that 36.6% of infants had moderate HIE whereas 35.1% had severe HIE stage.[21]

In the present study, 71.2% of the newborns had improved status which was followed by leaving against the medical advice (15.1%) while (8.2%) of the newborns were referred to other facilities for higher care and (5.5%) of the population had neonatal mortality. In a similar study, 76% of neonates improved after treatment followed by 7.4% deaths, 7% discharged on request, 6.8% left against medical advice (LAMA) and 2.8% were referred to other facilities [22]

Gender and newborn birth weight were not significantly associated. Findings contrasted with another study which showed gender did not have a significant association with HIE but birth weight was significantly associated.[23] In the present study 13% of the newborns with HIE had mortality, and 17.4% were referred for higher care, compared to newborns without HIE status, $p<0.05$. In a similar study, 66.7% of the newborns with HIE III had died while 4.5% were referred for higher care.[24] In the present study, gestational age was not significantly associated with HIE. A similar finding was identified in another study as well.[25] Mode of delivery had no significant association with HIE status ($p=0.555$) in current study. However, findings from other studies showed that there was a significant association with HIE status ($p=0.01$).[26]

However, significant association between duration of stay and HIE status was found in present study. Similar findings was observed in another study with significant association between duration of stay and HIE status ($p<0.01$).[27]

Conclusion

Perinatal Asphyxia is a significant cause of neonatal morbidity and mortality in developing countries. It is one of the common causes of NICU admission. This study identified important factors such as gender, birth weight, and mode of delivery which play roles in the incidence and outcomes of perinatal asphyxia. Despite many recent advancements in neonatal medicine, the burden of perinatal asphyxia is still high. Quality of antenatal care should be enhanced to identify and manage risk factors associated with perinatal asphyxia. Similarly, standardized protocols should be implemented for the diagnosis and management of perinatal asphyxia to ensure timely and appropriate interventions.

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