

Prevalence, Risk factors and Outcome of Perinatal Asphyxia in a Tertiary Care Hospital of Nepal

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Article received: 6th April, 2022

Article accepted: 22nd June, 2022

ABSTRACT

Introduction: Perinatal asphyxia is one of the leading causes of neonatal death in developing countries like Nepal. This study was done to evaluate the prevalence, risk factors and immediate outcome of perinatal asphyxia in newborns.

Materials and Methods: This was a prospective, cross sectional, observational study conducted in Neonatal Intensive Care Unit of Pokhara Academy of Health Sciences during a period of six months including 60 neonates. All inborn neonates with diagnosis of perinatal asphyxia with neonatal encephalopathy were included in the study and Hypoxic Ischemic Encephalopathy (HIE) staging was done. The important maternal risk factors and fetal risk factors and immediate outcome of neonates were recorded.

Results: The prevalence of perinatal asphyxia was 14.5 per 1000 live births; males 45% (27) and females 55% (33). Meconium-stained liquor was the most common risk factor accounting for 36.7% of cases followed by premature rupture of membrane (26.7%), maternal fever (6.7%). HIE III had (100%) mortality followed by HIE II (15.3%) and HIE I (5.1%) respectively whereas HIE stage I had good recovery (94.8%) followed by HIE II (84.6%).

Conclusion: Meconium-stained amniotic fluid and premature rupture of membrane are the two most common risk factors. Early detection and timely intervention of high-risk factors causing perinatal asphyxia can decrease mortality as well as morbidity.

Keywords: Hypoxic Ischemic Encephalopathy; Perinatal Asphyxia; Neonate

INTRODUCTION

World health organization (WHO) defines birth asphyxia as the failure to initiate and sustain breathing at birth.¹ Further American Academy of Pediatrics and American college of Obstetrics and Gynecology defines perinatal asphyxia on the basis of fulfillment of the criteria like profound metabolic acidemia (umbilical cord blood pH<7), APGAR score <3 in 5 minutes, signs of neurological abnormalities like seizures, encephalopathy and involvement of multiple organs.²

Perinatal asphyxia is a major problem in neonatal

period accounting for 9 % (0.8 million) of mortality. Perinatal asphyxia was the second most common cause of neonatal mortality after prematurity³. Majority of neonatal death i.e. 98% occur during first week of life due to perinatal asphyxia⁴ among which 75% of death related to birth asphyxia occurred during 24 hours of life and 2% occur within 72hours of life.⁵ Perinatal asphyxia is a multi-organ system disorder mainly affecting vital



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organs of body like kidney, heart and brain. The main organ affected from perinatal asphyxia is kidney (50%) followed by CNS, cardiac and lung dysfunction in 28%, 25% and 25% of cases respectively.⁶ Hypoxic ischemic encephalopathy is one of the leading cause of neonatal mortality and morbidity accounting for 26 cases per thousand live birth in developing countries, among which 20-30% die in neonatal period and 33-50% of survivors can develop permanent neurodevelopmental abnormalities (cerebral palsy, cognitive impairment).⁷ Various risk factors are associated with perinatal asphyxia such as antepartum factors (i.e. maternal age, maternal education, pre-eclampsia, primi-gravida), intrapartum risk factors (i.e. breech presentation, mode of delivery, maternal fever) and fetal risk factors (preterm babies, fetal distress and weight of baby).^{8,9,10}

The main objectives of this study are to find the prevalence of perinatal asphyxia and to identify the avoidable risk factors for neonatal encephalopathy as well as outcome of perinatal asphyxia.

MATERIALS AND METHODS

The study was a hospital based prospective cross-sectional study. It was conducted in Neonatal Intensive Care Unit (NICU) of Pokhara Academy of Health Sciences (PoAHS) including 60 neonates admitted with clinical diagnosis of perinatal asphyxia from (October 2021 to March 2022). Those neonates who could not initiate or sustain respiration at birth, by scoring an APGAR score less than 7 persistently for more than 5 min after delivery were included in the study with clinical diagnosis of perinatal asphyxia. Detailed history and examination of all neonates (admitted in NICU) during 6 months period as birth asphyxia was noted in proforma. APGAR score at 1 minutes, 5 minutes of life was recorded in the delivery room by trained health workers. Gestational assessment was done by modified Ballard's method. Neurological assessment of neonate was performed by using Sarnat and Sarnat staging⁶ and the immediate outcome of baby during NICU stay was recorded. Ethical clearance was obtained from Institutional Review Committee before commencing the study. Neonates having congenital anomalies and out born neonates were excluded from the study.

Sample size was calculated according formula $n = Z\alpha/2 PQ/d^2$ where, n = required sample size, $Z\alpha/2$ = Z deviate corresponding to deviate reliability level

(1.96) for 95% reliability, P = estimated proportion in the population (0.036)¹¹, $Q=1-P$ (0.964), d = maximum acceptable error (5%). The sample size was calculated as 53.

Detailed obstetrics history of mother including age, duration of labor, obstetric complications (intrapartum, antepartum,), number of ANC visits, gravida, type of delivery was obtained from maternal record files at the time of admission. History and detailed examination of neonate fulfilling inclusion criteria was performed in NICU by on duty pediatrician. Data was entered in SPSS version 23 and analyzed.

RESULTS

Total 4120 live births were delivered at PoAHS during the study period (October 2021 to March 2022) of 6 months, out of which 914 babies were admitted in NICU. Among them 60 babies were diagnosed with perinatal asphyxia, accounting for 6.56% of total NICU admission. Prevalence of perinatal asphyxia was 14.5 per 1000 live births.

Table 1. Gestational Age and Sex distribution of neonates

Gestational age	Male	Female	Total
Preterm	11	15	26 (43.3%)
Term	12	10	22 (36.7%)
Post term	4	8	12 (20%)
Total	27 (45%)	33 (55%)	60 (100%)

In our study, 26(43.3%) neonates were preterm followed by term 22(36.7%) and post-term 12 (20%). There were more female neonates - 33 (55%) than males - 27 (45%).

Table 2. Weight wise distribution of neonates

Weight (kg)	No. of neonates	Percentage
1 -1.49	24	40%
1.5 -2.499	15	25%
2.5-3.99	20	33.3%
>4	1	1.7%
Total	60	100%

In our study, the majority of neonates admitted with diagnosis of perinatal asphyxia were from weight group (2.5-3.99kg) accounting for 35% followed by

very low birth weight (1-1.49kg) 33.3% respectively.

Table 3. Age wise distribution of mothers

Age group (years)	No. of mothers	Percentage
<18	13	21.7%
18-34	38	63.3%
>35	9	15%
Total	60	100%

Table 2 shows distribution of mothers according to age. In our study majority of mothers 63.3% belonged to age group (18-34) years of age.

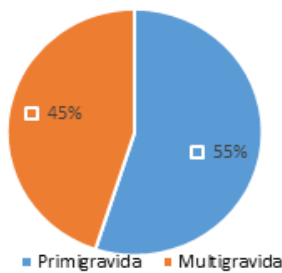


Figure 1. Parity of mothers

In this study, majority 55% mothers were primi-gravida.

Table 4. Distribution of maternal risk factors

Risk Factors	Number (N= 60)	Percentage
Meconium-Stained liquor	22	(36.7%)
Premature Rupture of Membrane	16	(26.7%)
Maternal Fever	4	(6.7%)
Preeclampsia	2	(3.3%)
Obstructed labor	2	(3.3%)
Foul Smelling liquor	1	(1.7%)
Prolonged labor	1	(1.7%)
Maternal Diabetes Mellitus	1	(1.7%)
Precipitate labor	1	(1.7%)
No risk factors	10	16.6%

In our study, meconium-stained liquor was the most common risk factor associated with perinatal asphyxia and was found in 22(36.7%) of neonates. This was followed by premature rupture of membrane (26.7%), maternal fever (6.7%), preeclampsia (3.3%), obstructed labor (3.3%), foul smelling liquor (1.7%), prolonged labor (1.7%), maternal diabetes mellitus (1.7%) and precipitate labor (1.7%).

Table 5. Total number and Outcome of neonates with perinatal asphyxia

	Total	Recovered	Died
HIE I	39 (65%)	37 (94.8%)	2 (5.1%)
HIE II	13 (21.66%)	11 (84.6%)	2 (15.3%)
HIE III	8 (13.33%)	0 (0%)	8 (100%)

During the study period, 12 cases of birth asphyxia died out of which HIE III had 100% mortality followed by HIE II (15.3%) and HIE I (5.1%) respectively whereas HIE stage I had good recovery (94.8%) followed by HIE II (84.6%).

DISCUSSION

Perinatal asphyxia is one of the serious problems in NICU leading to significant mortality and morbidity. It is basically due to the impairment of gas exchange which can occur before, during, or after delivery.¹² WHO estimated 4 to 9 million of neonates diagnosed with birth asphyxia every year, half of these die and similar number of those who survive develop severe sequelae like cerebral palsy, epilepsy and global developmental delay.¹³ In our study, the prevalence of perinatal asphyxia was found to be 14.5 per thousand live births accounting for 6.59% of NICU admission which is different from study done by Shrestha et al at Nepal Medical College, Kathmandu who found that 15.9% cases were diagnosed as perinatal asphyxia.¹⁴ Whereas study done by Dangol et al showed prevalence rate of 26.9% in Kathmandu University School of Medical Sciences, Dhulikhel.¹⁵

In our study 43.3% of neonates were preterm. Prematurity is one of the significant risk factors for developing perinatal asphyxia which is also supported by study done by Lee et al in southern part of Nepal¹⁶. Premature babies have immature blood brain barrier which makes brain vulnerable to cytokines mediated damage.¹⁷ In this study, out of 60 neonates 55% were female and 45% were male neonates. Majority of babies belonged to weight group (1-1.499 kg) accounting for 40% followed by 33.3% in (2.5- 3.5) kg weight group. This finding is supported by Aslam et al

who found the risk for developing birth asphyxia was high in weight 1–2 kg group (OR 0.13 CI 95% 0.05–0.32, $p < 0.01$) as compared to the infant with weight in the range of 2.5- to >3.5 kg.¹⁸ This may be due to associated conditions like hypertension and diabetes in mother before conception or during antepartum period.¹⁹

In our study, the majority of mothers were between 18–34 years age group (63.3%). The mean age of mothers was found to be 24.8 ± 2 years. This is similar to a study done by Padayachee et al in South Africa.²⁰ Asham et al also found commonest age group of mothers of neonate with perinatal asphyxia in range of 20–25 years.¹⁸ In this study, 55% of mothers were primigravida while 45% were multigravida. This is similar to study done by Yadav et al in Acharya Vinoba Hospital where 51.5% were primigravida.²¹

In this study, meconium-stained liquor was present in 26.7% of cases. This is supported by study done in Iceland by Lalsclottir et al where authors found 50% of birth asphyxia cases had meconium stained liquor.²² Similarly Tasew et al also found that neonates with meconium stained liquor were at 7.9 times higher risk of developing birth asphyxia [AOR = 7.88; 95% CI (2.92, 21.29)]¹⁰. This may be due to hypoxia or shock secondary to meconium related pulmonary complications.²³

In this study, 26.7% of mothers of neonates with perinatal asphyxia had premature rupture of membranes (PROM). Similarly Azam et al also found PROM as a significant risk factor for developing perinatal asphyxia in Nishtar Hospital.²⁴ In this study, 6.7% of mothers had fever during their pregnancy and 3.3% had pre-eclampsia.

In our study, the majority of newborn were diagnosed as HIE I (65%) followed by HIE II (21.66%) and HIE III (13.33%) respectively. Among HIE I, 94.85% of cases recovered while 5.1% died. Similar findings were obtained in a study done by Dangol et al in Dhulikhel hospital where 97.48% of HIE I recovered and 2.5% had died.¹⁵ We found 84.65% of HIE II cases survived with good recovery and 15.3% died during hospital stay. In present study, all 8 babies 100% of HIE III died during treatment course. This is supported by past studies where 75% of HIE III cases died in neonatal period and even if they survive they have universal risk of having sequelae.^{25, 26, 27}

CONCLUSION

Birth asphyxia is one of the most common causes

of neonatal mortality in a developing country like Nepal. Meconium-stained liquor, PROM, maternal fever are common risk factors for developing perinatal asphyxia. Birth asphyxia still remains a major public health issue, though various programs are made at different levels to address this issue. Guidelines for early detection of risk factors along with early referral of high-risk pregnancy and timely intervention with NICU intervention can help in reducing occurrence as well as mortality and morbidity due to perinatal asphyxia.

Limitation

The neonates admitted in Western Regional hospital with perinatal asphyxia were only included so the study was not able to include the home deliveries.

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