

Prevalence of perinatal asphyxia in neonates in a tertiary care center: A descriptive cross-sectional study

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Abstract

Introduction: Perinatal asphyxia is one of the major factors contributing to perinatal and early neonatal mortality in developing nations. The main objective of this study was to determine the prevalence of perinatal asphyxia among newborns admitted at Nepalgunj Medical College Teaching Hospital.

Methods: A descriptive cross sectional study was conducted in Nepalgunj Medical College Teaching Hospital. All newborns admitted at Nepalgunj Medical College Teaching Hospital were included from January 2022 to June 2022. A convenient sampling method was used. Recent version of Statistical Package for Social Sciences was used to analyze the data. Point estimate at 95% Confidence Interval was determined along with frequency and proportion.

Results: A total of 386 babies admitted over six months at NICU were enrolled in this study out of which 65 (16.83%) babies were asphyxiated at 95% Confidence Interval. Among 65 asphyxiated newborns, 47 (72%) were delivered in the hospital with remaining 18 (28%) were not. The prevalence of asphyxia in male newborn was 42 (64%) and female newborn was 23 (36%). HIE I was detected in 44 (68%), HIE II in 17 (26%) and HIE III in 3 (7%) of the 65 asphyxiated newborns. A case fatality rate of 3 (7%) was observed.

Conclusions: The prevalence of perinatal asphyxia was 16.83% which is quite similar to studies done in other tertiary care hospitals in Nepal. Perinatal asphyxia, or more accurately, Hypoxic Ischemic Encephalopathy (HIE), continues to be a major cause of significant mortality and long-term morbidity in newborns. Therefore, the current knowledge about obstetric and neonatal care should be intensified.

Keywords: Apgar score; Asphyxia; Hypoxic ischemic encephalopathy; Prevalence

1. Introduction

One of the main causes of perinatal and early neonatal mortality in developing nations, Perinatal Asphyxia accounts for one-fourth of the three million neonatal fatalities worldwide and nearly half of the 2.6 million stillbirths in the third trimester [1]. An estimated 4 million babies are born asphyxiated each year, which results in 1 million deaths and 1 million people suffering from major neurological conditions such cerebral palsy, mental retardation, or epilepsy [2].

Birth asphyxia can result from limited oxygen flow to the brain and impaired cerebral blood flow at the time of birth. It can later manifest as cerebral palsy and/or impaired cognitive, behavioral and motor development. The hypoxic insult from BA can result in irreversible CNS injury including necrosis and persistent inflammation, potentially leading to long-term sequelae or non-survival [3]. Preventing the original insult or injury has potential to both reduce associated mortality and risks of long-term impairment.

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The main objective of this study was to observe the prevalence of perinatal asphyxia in babies admitted in NICU at Nepalgunj Medical College and Teaching Hospital, Nepalgunj.

2. Material and methods

A descriptive cross-sectional study was conducted in Department of Pediatrics Neonatal Intensive Care Unit (NICU) of Nepalgunj Medical College (NGMC) from January 2022 to June 2022. A convenient sampling was done. Written consent was taken from the parents and possible complications of perinatal asphyxia were explained. Ethical clearance was taken from Institutional Review Committee (Ref no:11/079-080). All babies born after 28 weeks of gestation were included whereas babies born at unknown weeks of gestation and syndromic babies were excluded.

Perinatal asphyxia is defined as at least three of the following four characteristics in a neonate: Umbilical arterial cord pH <7.2 determined by blood gas analysis within first hour of birth, Apgar score ≤ 6 at 5 minute, requirement of >1 minute of positive pressure ventilation and signs of fetal distress (heart rate of less than 100 beats per minute, late decelerations or an absence of heart variability).[5] Perinatal asphyxia was diagnosed and categorized into mild, moderate and severe by using Apgar scores ranging from zero to ten in the first and fifth minutes of life. A score of less than seven indicated perinatal asphyxia, four to seven indicated moderate asphyxia whereas zero to three indicated severe asphyxia [6]. Severe asphyxia occasionally resulted in Hypoxic Ischemic Encephalopathy which was further categorized into stage I, II, III based on Leven's classification [7].

The sample size was calculated using the following formula:

$$\begin{aligned} n &= (Z^2 \times p \times q) / e^2 \\ &= (1.96)^2 \times 0.04 \times (1-0.04) / (0.02)^2 \\ &= 368.64 \\ &= 369 \end{aligned}$$

Where,

n= minimum required sample size,

Z= 1.96 at 95% Confidence Interval (CI)

p= prevalence taken as 3.66%⁵

q= 1-p

e= margin of error, 2%

The minimum required calculated sample size was 369. However, a total of 386 babies were included in this study using the convenience sampling method. Data regarding staging of Hypoxic Ischemic Encephalopathy, birth weight, gender of newborn, source of admission, maternal age and gestational age was recorded. Data were collected and entered in Microsoft Excel version 2007. Collected data were analyzed in the Statistical Package for the Social Sciences (SPSS) software version 25.0. Point estimate and 95% Confidence Interval were calculated.

3. Results

In this study, 65 (16.83%) babies were asphyxiated. Of the 65 newborns with perinatal asphyxia enrolled, 42 (65%) were male while 23 (35%) were female.

On basis of source of admission, 47 (72%) were delivered in the hospital with remaining 18 (28%) were not delivered in the hospital.

Clinical presentation of asphyxia was mild i.e. HIE I in 44 (68%), moderate i.e. HIE II in 17(26%) and severe i.e. HIE III in 3(7%) of the newborns. It was noted that prevalence of asphyxia in male newborn was 42 (64%) and female newborn was 23 (36%).

Forty (61%) of the new born were term babies, whereas reminder of 13(20%) were delivered before 37 week of gestation , 12(19%) were delivered after 40 completed weeks of gestation. Mode of delivery was via spontaneous vaginal delivery in 40 (62%) and caesarean section in the remaining 25 (38%) of cases.

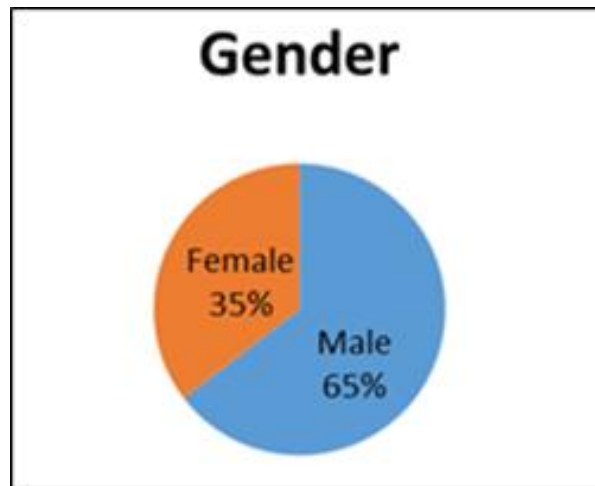


Figure 1 Gender Distribution in asphyxiated babies

Most of the newborns i.e, 39(60%) had birth weight between 2500g-3500g. The minimum age at presentation for newborns born within NGMC was 30 min and maximum age was 48 hours. Stratification based on the age of mother showed that 26(40%) were delivered by 20-25 years and 6(9%) by age below 20 years and 33(51%) by age above 25 years. A case fatality rate of 3(7%) was observed among asphyxiated newborns.

Table 1 Data's of perinatal asphyxia in neonates in NGMC

Variables Categories	Patients (n%)
Source of Admission	
Inborn	47 (72%)
Outborn	18 (28%)
Gestational age	
Less than 37 WOG	13 (20%)
37-40 WOG	40 (61%)
More than 40 WOG	12 (19%)
Mode of Delivery	
Spontaneous vaginal delivery	40 (62%)
Caesarean section	25 (38%)
Weight of babies	
Less than 1.5 kg	4(6%)
1.5-2.5 kg	10(15%)
2.5-3.5 kg	39(60%)
More than equal to 3.5 kg	12(19%)

4. Discussion

Perinatal asphyxia, or more accurately, hypoxia ischemic encephalopathy (HIE), continues to be a dangerous illness that causes significant mortality and long-term morbidity despite tremendous advancements in monitoring technology and knowledge of fetal and neonatal pathologies.[8] A normally developing fetus suffering a cerebral injury in the final hours of its intrauterine life and living for many years with a serious disability is tragic. The Birth asphyxia is the most frequent

reason for a newborn's admission to the NICU in our country.[9]In our study, the prevalence of perinatal asphyxia is 16.84% among admitted case in NICU in 6 month duration. This finding is quite similar to studies done in Nepal as in Nepal Medical College 15.9% by Shrestha S et al [10], 17.3% at College of Medical Sciences, Bharatpur by Gupta SK et al [11] and prevalence is low in comparison to 19.3% at Lumbini Medical College Teaching Hospital by Panthee K et al [12] and 26.9% at Kathmandu University School of Medical Sciences, Dhulikhel by Dangol S et al [13].

The difference in this prevalence may be related to the level of manpower, skills, and facilities in these centers for the care of asphyxiated newborns. However, such figures are still unacceptably high and demands intensified efforts in the improvement of skills and resources in the NICU with asphyxia and related morbidity. It was seen that prevalence is high in term male baby with weight in normal range. It was also observed that the respiratory rate, HR, oxygen saturation at presentation along with the place of delivery, and sex of newborn were significantly associated with case fatalities in perinatal asphyxia. Staging of HIE was seen to predict mortality in asphyxiated newborns in our study. We also conclude that most of the cases with HIE I were managed in primary care and severe were being referred to our center.

5. Conclusion

Among all stages of birth asphyxia, HIE stage I is the most common, then HIE stage II and finally HIE stage III. In comparison to HIE stage I, babies with stage III HIE had an extremely bad prognosis. The most frequent complication in cases of birth asphyxia is sepsis. Preterm and low birth weight babies were more likely to experience birth asphyxia. The risk variables for delivery asphyxia were maternal gravida, pregnancy complications with PROM, meconium, APH, emergency caesarean section, preterm, and male sex. Males were more likely than females to experience mortality and morbidity.

It will be challenging to design preventative and management strategies for birth asphyxia without a thorough understanding of the numerous risk factors and other related aspects. Without a doubt, one major restriction is the breadth of research on this subject in Nepal. The descriptive style of this study is its main drawback, although it does offer light on several aspects of birth asphyxia in a tertiary context in Nepal. Future research on birth asphyxia in the setting of Nepal will need to include prospective and case control studies.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest

Statement of informed consent

Informed consent was obtained from all individual participants' parent included in the study.

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