

Incidence, Severity and Early Outcome of Hypoxic-ischemic Encephalopathy among Newborns Born in a Rural Tertiary Care Centre in Southern India

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Abstract

Background: Hypoxic-ischemic encephalopathy (HIE) remains a great problem in developing countries. It occurs in 0.5% of live births of gestational age more than 36 weeks and accounts for 20% of perinatal deaths.

Objective: The aim of the study is to determine the incidence, severity and early outcomes of newborns born at tertiary care centre in southern India.

Methods: This study is a prospective study conducted among newborns with perinatal asphyxia for a period of 6 months from January 2017 to June 2017. The severity of HIE was classified by Sarnat and Sarnat staging. The asphyxiated babies were followed daily since birth to 7 days or until discharge, and the outcomes were noted.

Results: Out of 3130 term and near-term babies during the study period 2.7% ($n = 84$) had perinatal asphyxia. Among them 55% had mild HIE, 36% had moderate HIE, and 9% had severe HIE according to Sarnat and Sarnat staging. Out of 84 babies who had HIE, 4.8% ($n = 4$) babies died.

Conclusion: Incidence of perinatal asphyxia in our setting is little high. Morbidity and mortality of high initial score babies is very high. Good obstetric care and effective newborn resuscitation are vital in decreasing the occurrence of perinatal asphyxia and to improve the outcome of newborn babies.

Key words: Hypoxic-ischemic encephalopathy, perinatal asphyxia, sarnat and sarnat staging

INTRODUCTION

Perinatal asphyxia is a term which indicates impaired placental gas exchange leading to fetal hypoxemia and hypercarbia. Perinatal asphyxia contributes significantly to neonatal mortality accounting for nearly 20–25% of all neonatal deaths. It occurs in 0.5% of live newborn more than 36 weeks gestational age and accounts for 25% perinatal deaths.^[1]

According to Volpe, hypoxemia is defined as the “diminished amount of oxygen in the blood supply,” while cerebral ischemia is defined as the “diminished amount of blood perfusing the brain.” Cerebral ischemia is more important of the two forms of oxygen deprivation as it also leads to glucose deprivation. The terms hypoxia-ischemia and asphyxia are often used interchangeably, but from a pathophysiological viewpoint, they are not equivalent.^[2]

Hypoxic ischemic encephalopathy (HIE) also known as hypoxic-ischemic brain damage (HIBD) and hypoxic-ischemic reperfusion brain injury^[3] is one of the most serious conditions affecting the neonatal central nervous system. HIE is an abnormal behavioral state that consists of decreased level of consciousness and other signs of brainstem or motor dysfunction.

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Recent studies have shown that in addition to hypoxic-ischemic insult reperfusion and reoxygenation that occurs following resuscitation also plays an important role in causing injury to the neurons. HIE accounts for significant neonatal morbidity and mortality and also results in long-term neurodevelopmental sequelae causing cerebral palsy. Perinatal asphyxia usually leads to multiorgan system damage; other organ systems are affected well before the central nervous system.

Severe birth asphyxia^[4] was defined as an APGAR score of 0–3 and a score of 4–7 was labeled mild to moderate birth asphyxia. Most neonates' manifest symptoms within the first 12 h and the symptoms progress till 72 h to 5 days of age, with a brief period of improvement between 12 and 24 h.

The countdown report of 2015 estimated that neonatal deaths account for 45% of the 5.9 million child deaths that occurred in 2015 globally.^[5] In spite of advances in technology, better obstetric and neonatal care and a deeper understanding of the pathophysiology of perinatal asphyxia, HIE is still a major cause of mortality and neurodevelopment disability and current clinical management of the hypoxic-ischemic newborn infant is still limited to supportive measures.

MATERIALS AND METHODS

Study Design

This study design was a prospective study.

Study Period

This study was conducted from January 2017 to June 2017 for a period of 6 months.

Place of Study

A rural tertiary care centre at southern India Government Theni Medical College, Theni, Tamil Nadu, India.

Inclusion Criteria

All babies with gestational age ≥ 36 weeks with Apgar score <7 at 5 min are included in our study. Gestational age of babies was assessed from maternal last menstrual period and/or early antenatal ultrasound.

Exclusion Criteria

1. Preterm babies with gestational age <36 weeks
2. Babies with major congenital malformation/anomalies.

Methodology

Babies with asphyxia were assessed by Sarnat and Sarnat staging. They were classified according to Sarnat and Sarnat scoring system. The enrolled babies were assessed by 8

tools in Sarnat and Sarnat scoring criteria. Accordingly, they were classified as mild HIE, moderate HIE, and severe HIE with the score of 1–10, 11–14, and 15–22, respectively.

Data such as maternal age at gestation, mode of delivery, duration of delivery, birth weight, and any birth complications were collected.

The enrolled babies were followed up since birth till 7 days of postnatal life or till discharge whichever is earlier and the severity and outcome of the babies were studied. Treatments given were oxygen, intravenous fluids, anticonvulsants, mechanical ventilation, and other supportive measures. Therapeutic cooling is not available in our setup.

RESULTS

During the study period of 6 months (January 2017–June 2017) a total of 3507 babies were delivered with near-term and term babies of about 3130. Among them, 84 babies had birth asphyxia (Apgar Score <7 at 5 min), and they are enrolled for our study. The incidence of birth asphyxia among near-term and term babies in our study is 2.7%

In our study, among the 84 babies, 35% ($n = 29$) are <2.5 kg and 65% ($n = 55$) are >2.5 kg [Table 1 and Figure 1]. Among the 84 newborns, 62% ($n = 52$) are male babies and 38% ($n = 32$) are female babies [Table 2 and Figure 2].

Among these 84 babies, the mode of delivery is as follows: 5 babies by elective cesarean section, 29 babies by emergency cesarean section, 44 babies by normal vaginal delivery, 2 babies by breech delivery, and 4 instrumental delivery. Among these, Emergency caesarean section alone accounts for 35% ($n=29$) [Table 3 and Figure 3].

These babies are classified by Sarnat and Sarnat scoring system. Among them 55% ($n = 46$) developed mild HIE,

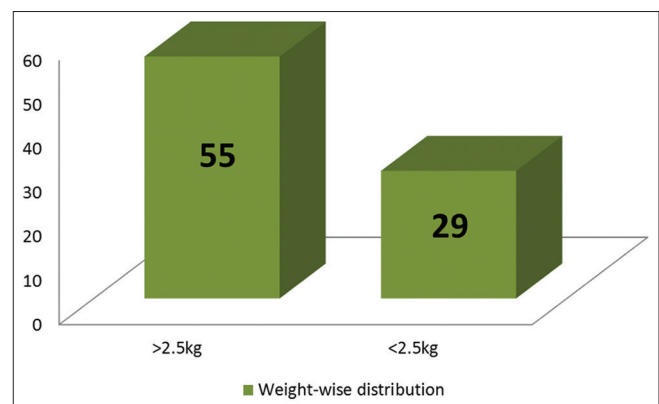


Figure 1: Comparison of asphyxiated babies based on birth weight

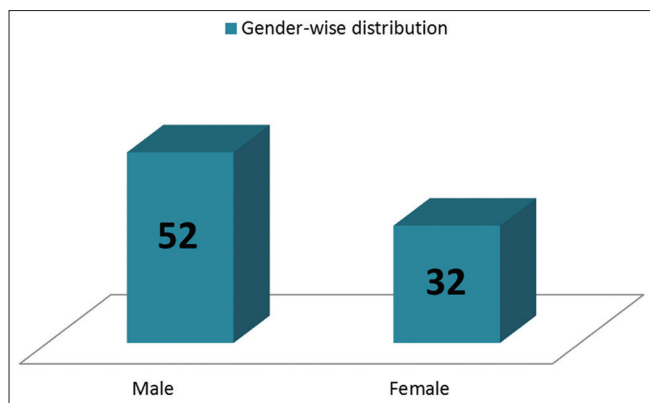


Figure 2: Gender wise distribution of the asphyxiated babies

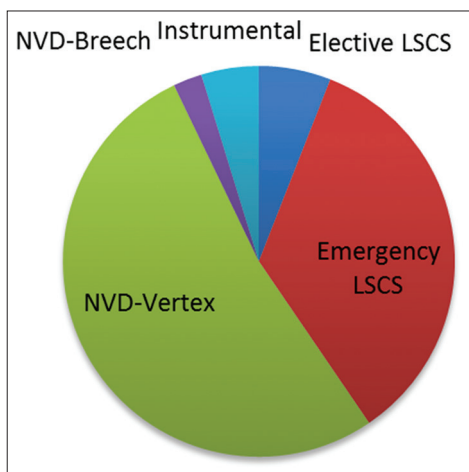


Figure 3: Categorization of babies based on mode of delivery

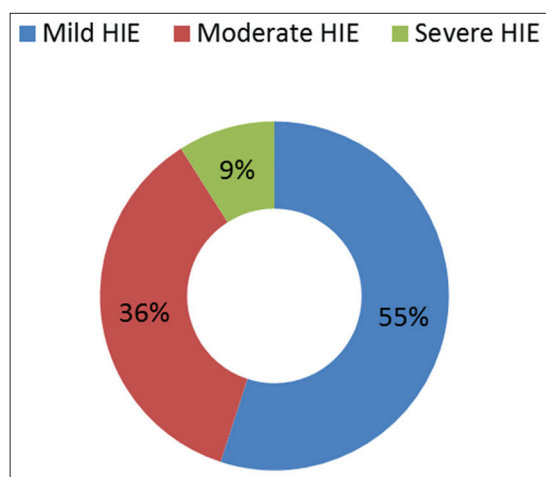


Figure 4: Classification of babies based on Sarnat and Sarnat staging

36% ($n = 30$) developed moderate HIE, and 9% ($n = 8$) developed severe HIE [Figure 4]. There are 4 deaths in the enrolled population. Among these deaths, all the babies are

Table 1: Comparison of asphyxiated babies based on birth weight

Birth weight	Number of babies
>2.5 kg	55
<2.5 kg	29

Table 2: Gender wise distribution of the asphyxiated babies

Gender	Number of babies
Male	52
Female	32

Table 3: Categorization of babies based on mode of delivery

Mode of delivery	Number of babies
Emergency LSCS	29
Elective LSCS	5
NVD-vertex	44
NVD-breech	2
NVD-instrumental	4

LSCS: Lower segment cesarean section, NVD: Normal vaginal delivery

in severe HIE stage. There are no deaths among mild HIE and moderate HIE group.

DISCUSSION

In our study, the incidence of HIE among term and near-term babies is around 2.7%. State of Newborn Health in India states that the reported incidence varies from 2% to 16.2% in community-based studies.^[6]

Our study showed that among the 84 babies, 65% of babies were >2.5 kg and 35% were <2.5 kg. The study by Yelamali *et al.* stated that 51% of the babies >2.5 kg and 49% of the babies <2.5 kg.

In our study, 62% were male babies, male to female ratio is 1.6:1, which is similar to study conducted in Karnataka where male to female ratio is 1.8:1. Also in the study conducted by Be Yelamali *et al.* showed 65% were males and 35% were females.^[7] Another study conducted by Roopa *et al.* at Mahadevappa Rampure Medical College, Gulbarga, Karnataka,^[8] showed a gender predominance of 56% in males compared to 44% in females.

In our study among the 84 babies, 34 babies (40%) were delivered by cesarean section. In a study conducted

in Motilal Nehru Medical College, Allahabad, 65% of asphyxiated babies were born through assisted delivery.^[9] Chandra *et al.* also observed cesarean section and breech delivery to be significantly associated with asphyxia.^[10]

Most of the babies in our study had mild HIE accounting for 55%. This is similar to the study conducted in The Government Medical College, Kozhikode, Kerala,^[11] where 56% of babies had mild HIE and another study conducted in northern Tanzania,^[12] where 50.8 % had mild HIE.

In our study, 95% of babies were discharged which is similar to the study conducted in Northern Tanzania^[12] and Pakistan.

CONCLUSION

Birth asphyxia is one of the most common causes of admission to NICU. In our center, there is a high incidence of emergency cesarean section (>35%) in the asphyxiated babies which shows the late referral of antenatal mothers from the peripheries. Early referral and adequate training regarding complicated labor to the peripheral centres can minimize the birth asphyxia and its related complications. Moreover, effective resuscitation and early intervention of asphyxiated babies will have a good outcome.

REFERENCES

1. Cloherty JP, Eichenwald EC, Clark AR. Perinatal asphyxia. Manual of Neonatal Care. 7th ed. Ch. 55. Philadelphia, PA: Lippincott Williams and Wilkins; 2012. p. 712.
2. Volpe JJ. Neurology of the Newborn. 4th ed. Philadelphia, PA: WB Saunders Company; 2001. p. 217-76.
3. Guha DK. Guhas Neonatology Principles and Practice. 3rd ed., Vol. 2. New Delhi: Jaypee Brothers Medical Publishers; 2005. p. 966.
4. Guha DK. Guhas Neonatology Principles and Practice. 3rd ed., Vol. 1. New Delhi: Jaypee Brothers Medical Publishers; 2005. p. 392.
5. WHO, UNICEF. Countdown to 2015: A Decade of 2015. Geneva: World Health Organization. 2015.
6. Sankar MJ, Neogi SB, Sharma J, Chauhan M, Srivastava R, Prabhakar PK, *et al.* State of newborn health in India. J Perinatol 2016;36 Suppl 3: S3-8.
7. Yelamali BC, Panigatti P, Pol R, Talawar KB, Naik S, Badakali A. Outcome of newborn with birth asphyxia in tertiary care hospital. Med Innov 2014;3:59-64.
8. Mangshetty RB, Tallolli I, Patil S. Cardiac troponin-I as a marker of myocardial damage in newborns with hypoxic ischemic encephalopathy. J Evol Med Dent Sci 2014;3:15482-6.
9. Mohan K, Mishra PC, Singh DK. Clinical profile of birth asphyxia in newborn. Int J Sci Technol 2013;3:1-19.
10. Chandra S, Ranji S, Thirupuram S. Perinatal asphyxia multivariate analysis of risk factor in hospital births. Indian Pediatr 1997;34:206-12.
11. Lally PJ, Price DL, Pauliah SS, Bainbridge A, Kurien J, Sivasamy N, *et al.* Neonatal encephalopathic cerebral injury in south india assessed by perinatal magnetic resonance biomarkers and early childhood neurodevelopmental outcome. PLoS One 2014;9:e87874.
12. Simiyu IN, Mchale DN, Katsonger K, Philemon RN, Msuya SE. Prevalence, severity and early outcomes of hypoxic ischemic encephalopathy among newborns at a tertiary hospital, in northern Tanzania. BMC Pediatr 2017;17:131.

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