

Correlation of Hypoxic Ischemic Encephalopathy Stages with Clinical Variables

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Abstract

Background: Injury to the CNS related with perinatal asphyxia is referred to as Hypoxic-Ischemic Encephalopathy which is the utmost severe neurological condition that arises in perinatal periods. The aim is to assess clinical variables with hypoxic-ischemic encephalopathy stages. **Subjects and Methods:** A clinical study of 42 new borns asphyxiated were assessed clinically of these asphyxiated neonates was carried out using Sarnath and Sarnath Staging of HIE. The association between asphyxia at birth and HIE has been examined. **Results:** In the present study, maternal history, gestational age, and mode of delivery were found to be not significant and do not correlate with the severity of HIE. Sarnath and Sarnath clinical scoring for neurobehavioral signs and symptoms 13 (31%) had reveal of HIE stage -1, 14 (33%) are of stage -2 and severe HIE (HIE-III) common, seen in 15 cases (36%). The correlation of non-stress test (NST), Meconium staining was more in stage-3 in HIE stages and statistically significant. **Conclusion:** During the diagnosis and treatment of HIE patients, analysis of clinical variables will improve the objectivity of newborn assessment and evaluation and early start of care.

Keywords: Hypoxic Ischemic Encephalopathy, Sarnath, Sarnath clinical scoring

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Received: 20 May 2020

Revised: 25 June 2020

Accepted: 2 July 2020

Published: 10 October 2020

Introduction

Perinatal asphyxia attribute to a state in the 1st and 2nd phases of labor in which compromised circulation contributes to fetal hypercarbia, hypoxemia leading to metabolic acidosis. [1] A significant component for Perinatal asphyxia is perinatal and neonatal mortality. [2] most significant long-term result of birth asphyxia is cerebral palsy which can be followed by intellectual under development, epilepsy disease, or any visual or auditor, cognitive and sensory disorders. It is the 5th big cause of child deaths under 5 years of age (8.5 percent) after pneumonia, neonatal infections, diarrhea and hurdle of premature birth. [3]

Dr. Virginia Apgar developed a scoring system which was a quick practice of evaluating the newborn infant's clinical condition at the age of 1st minute. [4] It was conceived as a guide to the need for newborn resuscitation, and evolved as an objective tool that assessed five signs of physiological adaptation. This scoring system was fast gaining near-universal acceptance. However, the Apgar score can somewhat assess mortality, it's not a method that can be used only for the assessment of living infants' neurological outcomes. Most

childbirths in developed countries typically occur at home, with untrained birth attendants attending. Lack of execution and retention of oxygen. Immediately after birth, serious fetal hypoxia or ischemia may develop as encephalopathy in the infant, called Hypoxic Ischemic Encephalopathy (HIE). The fetus with a substantial episode of hypoxia is at risk of developing HIE which can result in neonatal mortality or irreversible motor which mental disability. In India, 8.4 percent of inborn babies have less than 7 percent 1 minute Apgar score and 1.4 percent put up from HIE. [5]

Nevertheless, in many neonatal units in developed countries such as India, these modalities are not readily accessible and thus the centers depend heavily on clinical evaluation and scoring mechanisms to assess the neurological injury. Our study aims to consider the occurrence of HIE in asphyxiated newly born neonate based on the existing method of neurological scoring and aims to assess the estimation of the grading of neurological damage depending on the seriousness of the sustained asphyxia.

Subjects and Methods

It is carried out in the neonatal unit of the Department of Pediatrics in association with the Department of Obstetrics and Gynaecology. This is a prospective study that included 42 neonates selected as per inclusion criteria.

Inclusion criteria:

Term Babies admitted to NICU with a score of Apgar 6 or less at birth, at 5 minutes. Intrapartum signs of fetal distress and amniotic fluid stained with meconium.

Positive pressure venting condition of > 1 min Moderate, moderate, or extreme HIE as described by staging Sarnat and Sarnat.

Exclusion criteria:

Suspected metabolic disease, congenital malformations, fever within 2 months before delivery, Those born to mothers having HTN, DM, toxemia of pregnancy.

Total obstetric history was collected, and after birth examination of the babies was carried out. The neonatal clinical course was prospectively followed up and predesigned proforma data was recorded. For all infants, written informed parental consent was obtained before entry into the study, approved by the ethical committee.

HIE was classified as mild (grade I), moderate (grade II) or severe (grade III) by H.B.

Sarnat, M.S and Sarnat.^[6] Assessment of Clinical encephalopathy was performed 24 to 48 hours after birth.

Microsoft Excel and SPSS applications performed sufficient data entry and mathematical analysis. Number and percentage are presented as categorical variables. The Chi-square test compares the association between two or more categorical variables. A statistically relevant p-value of < 0.05 has been taken.

Results

Among 42 newborns 28 (66.7%) were males and 14 (33.3%) were females and 24 (57.2%) were term and 17 (40.4%) were post-term as per gestational age. As per the mode of delivery, most of the cases are of LSCS with 17 cases (40.4%) and newborns born to primigravida are more with 27 cases (64.3%).

Sarnath and Sarnath clinical scoring for neurobehavioral signs and symptoms 13 (31%) had evidence of HIE stage -1, 14 (33%) are of stage -2 and severe HIE (HIE-III) common, seen in 15cases (36%).

Clinical variables are not significant in HIE I and II stages.

The correlation of non-stress test (NST) whether reactive or non-reactive which is an indicator of fetal distress affects HIE

Table 1: Demographic

Gender	Number of cases	Percentages
Males	28	66.7
Females	14	33.3
Gestational age		
Preterm	1	2.4
Term	24	57.2
Post-term	17	40.4
Mode of delivery		
Normal vaginal delivery	13	31
With instrumentation	12	28.6
Lower segment cesarean section (LSCS)	17	40.4
Maternal gravida		
Primi	27	64.3
Multi	15	35.7

Table 2: Clinical

Meconium stained amniotic fluid	Number of cases	Percentages
No staining	17	40.4
Stained	25	59.6
Nonstress test		
Reactive	13	31
Nonreactive	29	69
Outcome		
Discharge	39	92.9
Death	3	7.1

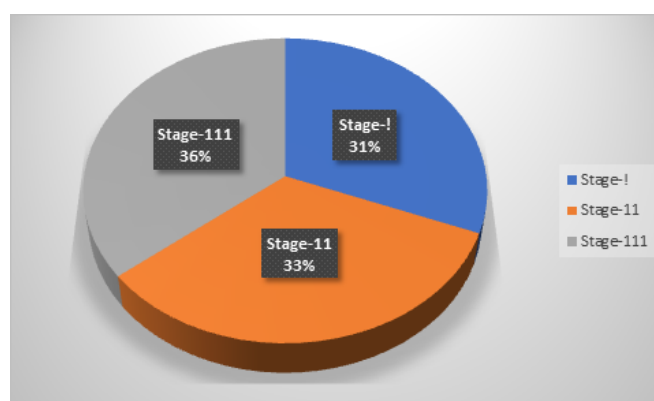


Figure 1: HIE

Table 3: Correlation of clinical variables with HIE I and II stages in the study

Variables	Stage-I N (%)	Stage-2 N (%)	P-Value
Gestational age			
Preterm	1 (7.7%)	0	>0.05
Term	8 (61.5%)	7 (50%)	
Post-term	4 (30.8%)	7 (50%)	
Mode of Delivery			
Normal vaginal delivery	4 (30.7%)	5 (35.7%)	>0.05
With instrumentation	3 (23.1%)	4 (28.6%)	
Lower segment cesarean section	6 (46.2%)	5 (35.7%)	
Maternal Gravida			
Primi	8 (61.5%)	9 (64.3%)	>0.05
Multi	5 (38.5%)	5 (35.7%)	
Meconium stained amniotic fluid			
No staining	5 (38.5%)	6 (42.%)	>0.05
Stained	8 (61.5%)	8 (57.1%)	
Nonstress test			
Reactive	6 (46.2%)	7 (50%)	>0.05
Non reactive	7 (53.8%)	7 (50%)	
Outcome			
Discharge	13 (100%)	13 (92.8%)	
Death	0	1 (7.1%)	<0.05

stages among the cases and it was found to be statistically significant.

Meconium staining was more in stage-2 in HIE stages and statistically significant.

The correlation of outcome with HIE stages among the cases and it was found that 13.3% death and all were with HIE stage 3 and was statistically significant.

The correlation of non-stress test (NST) whether reactive or non-reactive which is an indicator of fetal distress affects HIE stages among the cases and it was found to be statistically significant.

Meconium staining was more in stage-3 in HIE stages and statistically significant.

The correlation of outcome with HIE stages among the cases and it was found that 33.3% death and all were with HIE stage-3 and was statistically significant.

Discussion

HIE is serious enough to inflict irreversible brain damage, is prevailing retrospectively characterized by consensus-based

standards, which together represent a psychiatric condition defining a causal mechanism of HIE. The mechanism provides proof of fetal complications in the last hours prior to delivery, distress at delivery and require for resuscitation, extreme metabolic acidosis, neonatal health and diagnostic symptoms of acute neurological disorders, indications of other processes dysfunction, and absence of other causes of neonatal encephalopathy.^[7] Sarnat and Sarnat's three step categorization of HIE is widely used; the most serious period in periodic exams, between 1 h and 7 days of life, is the most effective step in prediction and follow-up decisions.^[6]

This study aimed to consider the occurrence of HIE in asphyxiated newborns placed on the existing neurological scoring system and to compare the incidence of hypoxic-ischemic encephalopathy in different infant, perinatal and maternal variables in asphyxiated newborns. Fifty asphyxiated newborns have been examined and both follow the requirements for inclusion. Among these asphyxiated newborns born in our hospital, Among 42 newborns 28(66.7%) were males and 14 (33.3%) were females, and 24 (57.2%) and as per gestation; term and 17 (40.4%) were post-term.

Ritambhara Lohan et al study males were 30 cases (60%) and females were 20 cases (40%) and as per gestation, 31

Table 4: Correlation of clinical variables with HIE II and III stages in the study

Variables	Stage-2 N (%)	Stage-3 N (%)	P-value
Gestational age			
Preterm	0	0	
Term	7 (50%)	9 (60%)	>0.05
Post term	7 (50%)	6 (40%)	
Mode of Delivery			
Normal vaginal delivery	5 (35.7%)	4 (26.7%)	>0.05
With instrumentation	4 (28.6%)	3 (20%)	
Lower segment cesarean section	5 (35.7%)	8 (53.4%)	
Maternal Gravida			
Primi	9 (64.3%)	10 (66.7%)	>0.05
Multi	5 (35.7%)	5 (33.3%)	
Meconium stained amniotic fluid			
No staining	6 (42.%)	5 (33.3%)	
Stained	8 (57.1%)	10 (66.7%)	<0.05
Nonstress test			
Reactive	7 (50%)	5 (33.3%)	
Nonreactive	7 (50%)	10 (66.7%)	
Outcome			
Discharge	13 (92.8%)	13 (86.7%)	<0.05
Death	1 (7.1%)	2 (13.3%)	

cases (62%) were term and 19 cases (38%) preterm. [8] Dalal A et al in their study had 168 cases (52.5%) males and 152 cases (47.5%) females and 87% were term neonates and 13% preterm neonates. [9]

In the present study used Sarnath and Sarnath clinical scoring for neurobehavioral signs and symptoms 13 (31%) had evidence of HIE stage -1, 14(33%) are of stage -2 and severe HIE (HIE-III) common, seen in 15cases(36%). Which is by Ritambhara Lohan et al study out of 21 cases of HIE, 5 (23.81%) were HIE-I, 7 (33.33%) HIE-II, and 9 (42.86%) HIEIII. [8]

In comparison with HIE -II to III and HIE -I to III are in a correlation of non-stress test (NST) whether reactive or non-reactive which is an indicator of fetal distress affects HIE stages among the cases and it was found to be statistically significant. (P-value of < 0.001)

Meconium staining was also statistically significant. The correlation of outcome with HIE stages among the cases and it was found that 33.3% death and all were with HIE stage 3 and was statistically significant. In the study Priyanka Akka et al non-reactive nonstress test (NST) and thick meconium staining of the liquor found to be statistically significant. [10] Milsom et

al. reported only 1 antepartum factor but 6 intrapartum factors separately correlated with low Apgar scores in a population-based case control analysis of 227 premature babies who had low Apgar scores not due to maternal anesthesia, congenital malformations, or chromosomal abnormalities. [11]

The involvement of meconium and a cesarean birth is linked to HIE in the group of 75 babies that eventually experienced encephalopathy. Several authors correlated poorly Apgar scores with meconium contaminated amniotic fluids. [12] Throughout these tests, when meconium was present, the frequency of low one and five minute Apgar score was nearly 2 times greater. Ash AK et al indicated that meconium contaminated amniotic fluids may indicate underlying acute or chronic fetal hypoxia with adverse perinatal outcomes. [13] In conclusion, consideration of clinical variables during the diagnosis and treatment of HIE cases that boost the objectivity of newborn evaluation and monitoring and early start of care. HIE scoring methods were used in many trials. Portman et al. established a statistical the score of early morbidity and mortality. [14] Although others established a score that was related to longterm outcome. HIE's most commonly adopted classification is Sarnat and Sarnat, [6]

Table 5: Correlation of clinical variables with HIE I and III stages in the study

Variables	Stage-I N (%)	Stage-3 N (%)	P-Value
Gestational age			
Preterm	1 (7.7%)	0	>0.05
Term	8 (61.5%)	9 (60%)	
Post term	4 (30.8%)	6 (40%)	
Mode of Delivery			
Normal vaginal delivery	4 (30.7%)	4 (26.7%)	>0.05
With instrumentation	3 (23.1%)	3 (20%)	
Lower segment cesarean section	6 (46.2%)	8 (53.4%)	
Maternal Gravida			
Primi	8 (61.5%)	10 (66.7%)	>0.05
Multi	5 (38.5%)	5 (33.3%)	
Meconium stained amniotic fluid			
No staining	5 (38.5%)	5 (33.3%)	<0.05
Stained	8 (61.5%)	10 (66.7%)	
Nonstress test			
Reactive	6 (46.2%)	5 (33.3%)	<0.05
Non reactive	7 (53.8%)	10 (66.7%)	
Outcome			
Discharge	13 (100%)	13 (86.7%)	<0.05
Death	0	2 (13.3%)	

using EEG and other laboratory criteria that may not be possible in a developed world neonatal unit. In another study, a comprehensive follow-up of neurodevelopment was conducted on 167 children with an HIE diagnosis. In that study, a larger proportion of handicapped infants are diagnosed with neonatal convulsion.^[15] While neonates that experienced convulsions in this research group are at an elevated risk of damage from neurodevelopment and required close monitoring. A study conducted by Finner et al. to determine causes impacting HIE outcome in term infants showed that variables that were strongly associated with outcome included the Sarnat grading and obdurate seizure frequency.^[16] It was observed that there was no correlation between Apgar score 1 or 5 min, requirement of ventilation, EEG, seizure frequency and subsequent outcome. This study coherent with the earlier report that the result of neurodevelopment of infants with HIE is consistent with the Sarnat stage of encephalopathy and it is suspected that the occurrence of seizures is a risk of dysfunction of neurodevelopment.

Conclusion

During the diagnosis and treatment of HIE patients, analysis of clinical variables will improve the objectivity of newborn assessment and evaluation and early start of care.

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How to cite this article: Sekhar MC. Correlation of Hypoxic Ischemic Encephalopathy Stages with Clinical Variables. Asian J. Clin. Pediatr. Neonatol. 2020;8(3):1-6.

DOI: dx.doi.org/10.47009/ajcpn.2020.8.3.1

Source of Support: Nil, **Conflict of Interest:** None declared.

AJCPN