



A Clinical Study of Hypoxic Ischemic Encephalopathy in Relation to Perinatal Asphyxia in Newborns Admitted in King George Hospital, Visakhapatnam

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Abstract

Background: Central Nervous System Dysfunction (Neonatal Encephalopathy) associated with Perinatal Asphyxia is called Hypoxic Ischemic Encephalopathy. Perinatal Asphyxia contributes significantly to Neonatal Morbidity and Mortality. The main aim of the study is to study the clinical profile and to assess the immediate outcome in asphyxiated newborns.

Materials and Methods: A prospective clinical study of 70 term Newborns with Perinatal Asphyxia admitted in NICU KGH from May 2018 to April 2019. Neurological assessment of these neonates was performed and stage of encephalopathy assessed. The relationship between severity of Asphyxia and severity of HIE was studied. Evaluation of other organ systems (Renal, Cardiac, Pulmonary, Git) was performed. Term asphyxiated newborns (inborn and outborn) referred to NICU, KGH were included in this study. Newborns with Congenital malformations, congenital neuromuscular diseases and syndromic babies were excluded from the study.

Results: HIE occurred in 60% of asphyxiated newborns. 54.7% of them had stage I HIE and 28.6% had stage II HIE and 16.7% had stage III HIE. There was significant association between severity of perinatal asphyxia and severity of HIE.

Conclusions: Significant proportion of neonates develop HIE following asphyxia insult. Most of them developed HIE stage-I encephalopathy. As the APGAR score decreases the severity of HIE increases. Following perinatal asphyxia most neonates developed at least one organ dysfunction other than CNS. Kidney is the most frequently involved organ.

Introduction

The World Health Organization describes birth asphyxia as failure to initiate and sustain breathing at birth¹. Globally, about one quarter of all neonatal death are caused by birth asphyxia². According to World Health Organization estimates in the developing countries 3% of all infants (3.6 million) suffer from moderate to severe birth asphyxia of which 23% (840,000) die and approximately the same number develop serious sequelae³.

Perinatal asphyxia is an insult to the fetus or newborn due to lack of oxygen (hypoxia) or lack of perfusion (ischemia) to various organs of the body in sufficient magnitude and duration. In term infants, 90% of insults occur in the antepartum or intrapartum periods as a result of placental insufficiency. The remainder is postpartum usually secondary to pulmonary, cardiovascular or neurologic abnormalities. The proportion of postpartum events is higher in premature neonates, especially in ELBW infants⁴.

Since the contribution of birth asphyxia to burden of neurodisability in developing country population is still to be accurately defined, hence the study was to assess the direct relationship between degree of asphyxia and severity of HIE.

Aims and Objectives

- To study the clinical profile of perinatal asphyxia.
- To assess the immediate outcome in asphyxiated newborns.

Materials and Methods

Informed written parental consent was obtained for all newborns before entry into the study, which was approved by the ethical committee. Complete obstetric history was obtained and examination of the babies was performed at the time of admission.

Detailed neurological examination of the asphyxiated newborns was performed at 12-24 hour intervals for the first six days and thereafter every alternate day until discharge or until death. The stage of encephalopathy was assessed according to Sarnat and Sarnat Clinical staging system. The relationship between severity of perinatal asphyxia and severity of HIE was studied. The involvement of other organ systems was also noted on the basis of the clinical/laboratory criteria.

The data obtained was analyzed by using the Chi square test, Fisher Exact test, Analysis of Variance/ Kruskal Wallis test.

The Statistical software namely SPSS were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc. p value <0.05 was considered for statistical significance.

Results

Among 70 asphyxiated newborns, 36 [52%] were males while 34 [48%] were females. 65 [92.85%] babies were of term gestation, while 5 [7.15%] were postterm. Among 70 asphyxiated newborns, 39 (55.8%) newborns' mothers were Primigravida

and 31 (44.2%) were Multigravida. Pregnancy was complicated by the presence of PIH in 9 (14%), APH in 2 (2.8%), MSAF was present in 40 (57.1%), maternal anemia was found to be present in 12 (17.1%) and PROM in 7 (10%). Breech presentation occurred in 6(8.5%) and vertex in 64 (91.4%). Labour was complicated by prolonged II stage in 10(14.2%) of them and cord prolapse was seen in 1 (1.4%).

Table 1 Clinical profile of birth asphyxia

	Number	Percentage
Sex		
Male	36	52%
female	34	48%
Mode of delivery		
Vaginal	33	47.1%
Instrumental	7	10%
LSCS	30	42.8%
Risk factors		
MSAF	40	57.1%
PROM	7	10%
PIH	9	14%
APH	2	2.8%
Cord prolapsed	1	1.4%
Anemia	12	17.1%
HIE stages		
Stage I	23	54.7%
Stage II	12	28.6%
Stage II	7	16.7%
Total	42	

33 (47.1%) of the deliveries were spontaneous vaginal, 7(10%) were instrumental and 30 (42.8%) were delivered by LSCS.

HIE occurred in 42(60%) out of 70 asphyxiated neonates. According to Sarnat and Sarnat clinical HIE staging, 23 (54.7%) newborns had stage I, 12 (28.6%) had stage II and 7 (16.7%) of the newborns had stage III HIE.

Among HIE stage I, all the babies that is 23 (100%) were normal, in HIE Stage II 8 (66.67%) were normal, 3 (25%) of them had persisting neurological abnormality and 1 (8.33%) newborn died. In HIE stage III, 2 (28.6%) had persisting neurological abnormality and 5 (71.4%) newborns died.

Outcome in HIE stages

HIE staging	Outcome			Total
	Normal	Persisting neurological abnormality	Death	
Stage I	23 (100%)	-	-	23
Stage II	8 (66.67%)	3 (25%)	1 (8.33%)	12
Stage III	-	2 (28.6%)	5 (71.4%)	7
Total	31 (73.8%)	5 (12%)	6 (14.2%)	42

In the present study, there was a statistically significant ($p < 0.001$) association between severity of perinatal asphyxia and severity of HIE. As the Apgar score at 1 minute decreases the severity of HIE increases.

Correlation of Apgar score values with HIE stages

HIE stage	Apgar score (at 1 minute)	
	Range	Median
Stage I	2-5	4.00
Stage II	1-4	3.00
Stage III	1-3	2.00

In the present study, involvement of other organs was studied. Renal involvement occurred in 19 (46%) of the total asphyxiated neonates and was the most commonly involved organ, next only to HIE (60%). Pulmonary involvement occurred in 10 (22%), cardiac in 10 (24%) and involvement of GIT was seen in 9 (23.0%).

Frequency of organ involvement among the asphyxiated newborns

Organ Involvement	Number	Percentage
Renal	19	46%
Pulmonary	10	22%
Cardiac	10	24%
GIT	15	35%

Discussion

This study was conducted as an attempt to evaluate the development of encephalopathy in term asphyxiated neonates, to correlate the severity of asphyxial insult to the severity of HIE and to assess the immediate outcome.

The development of HIE was analyzed with regard to general neonatal and perinatal factors. In the present study males were affected more than females which is similar to study done by Siva Saranappa S B et al, Pareshkumar A. Thakkar et al and Kumar A et al^{8,9,10}.

In the present study MSAF was the major contributing risk factor accounting for 57.1% of cases which is higher than the studies done by Siva Saranappa S B et al [40%] and Kumar A et al [48%]^{8,10}.

It was seen that HIE stage I was the most common followed by HIE stage II and finally HIE stage III, this was similar to study done by Siva Saranappa S B et al and Kumar A et al^{8,10}. All Babies with HIE stage I had recovered and had a good prognosis while those with Stage III had high morbidity, this was also in consistent with the study done by Siva Saranappa S B et al in which all the babies with HIE III were expired.

In the present study, there was a statistically significant ($p < 0.001$) association between severity of perinatal asphyxia and severity of HIE. As the Apgar score at 1 minute decreases the severity of HIE increases. Although apgar score does not exactly predict the neurodevelopmental outcome the 5 minute Apgar score is still the most practical, feasible and valid index for assessing the effectiveness of resuscitation and vitality of newborn⁷.

The overall mortality in the present study is 14.2% which is higher than Siva Saranappa S B et al [8%] and Kumar A et al [10%].

Conclusion

Significant proportion of neonates develop HIE following asphyxia insult. Most of them developed HIE stage-I encephalopathy. As the APGAR score decreases the severity of HIE increases. Following perinatal asphyxia most neonates developed at least one organ dysfunction other than CNS. Kidney is the most frequently involved organ.

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