

Effect of the perinatal risk factors on the outcome of the term asphyxiated neonates at the time of discharge in NICU

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Abstract

Hypoxic-ischemic encephalopathy (HIE) secondary to perinatal asphyxia remains a major cause of neonatal mortality and morbidity worldwide. Perinatal asphyxia was responsible for 20% of all neonatal deaths. Manifestations of HIE were seen in approximately 1.5% of all babies. **Aims and Objectives of the study:** 1. To study the various perinatal risk factors which are contributing to HIE. 2. To study the outcome of the term asphyxiated neonates at the time of discharge in relation to the perinatal risk factors. **Materials and method:** This prospective study was conducted on the term asphyxiated babies who were admitted in ASRAM medical college, Eluru during the period of January 2013 to August 2014. **Result:** The incidence of the HIE in neonates in the present study is 15.5%. Males neonates were more in number 40 (61.5%) than female neonates 25 (38.5%). Cord entangled twice around the neck was having very poor prognosis 83.4%. **Conclusion:** In the present study cord around the neck, the neonates having Apgar score <3 at 5min have shown poor prognosis and deaths. Pediatrician presence at the time of delivery is associated with good prognosis in the neonates.

Key words: Hypoxic-ischemic encephalopathy, APGAR Score, Neonatal Resuscitation

Introduction

Hypoxic-ischemic encephalopathy (HIE) secondary to perinatal asphyxia remains a major cause of neonatal mortality and morbidity worldwide. The definition of perinatal asphyxia is variably indistinct. "Failure to initiate or sustain respiration after birth" has been defined as criteria for the diagnosis of asphyxia by WHO [1].

All the following must be present for designation of asphyxia [2].

- (a) Profound metabolic or mixed acidemia (pH < 7.00) in cord blood.
- (b) Persistence of Apgar scores 0-3 for longer than 5 minutes.
- (c) Neonatal neurologic sequelae (eg, seizures, coma, Hypotonia).

- (d) Multiple organ involvement (eg, kidney, lungs, liver, heart, intestine)

Definitions based on Apgar scores may be useful as it can be used for formulating guidelines for post-asphyxial treatment of neonates. Apgar scores are also useful for predicting long term outcome in infants with perinatal asphyxia [3,4].

Hypoxic-ischemic cerebral injury results from a combination of hypoxemia and ischemia, which often is associated with impaired cerebrovascular auto regulation and exacerbated by diminished cerebral glucose substrates, lactic acidosis, the accumulation of free radicals and excitotoxic aminoacids (especially glutamate) and other metabolic derangements. The localization and the extent of the perinatal Hypoxic – Ischemic cerebral injury is determined principally by the maturity of the brain at the time of the insult.

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Indian data: According to NNPD 2003 data collected from 17 tertiary neonatal intensive care units in India, Apgar scores <7 at 1 minute (includes moderate and severe asphyxia) were documented in 9% of all intramural deliveries [1]. 22.5% babies continued to have Apgar scores <7 at 5 minutes of age. Perinatal asphyxia was responsible for 20% of all neonatal deaths. Manifestations of HIE were seen in approximately 1.5% of all babies. Perinatal asphyxia was the commonest cause of still-births accounting for one-third of all such cases. Perinatal asphyxia is the most important cause of preventable cerebral injury occurring in the neonatal period. Full recovery may not occur and many children are left with lifelong neurological impairment and in some cases, incapacitating disability. Data from National Neonatal Perinatal database suggests that perinatal asphyxia contributes to almost 20% of neonatal deaths in India. Between 20% and 50% of newborn infants affected by perinatal brain injury die during the newborn period, and 25–60% of the survivors suffer from permanent neurodevelopmental handicaps, including cerebral palsy, seizures, mental retardation, and learning disabilities [5-7]. This creates a great burden for the family, as well as for the society. Seizures occur in approximately 50% of asphyxiated infants are indicative of moderate or severe encephalopathy.

Aims and objectives of the study

1. To study the various perinatal risk factors which are contributing to HIE.
2. To study the outcome of the term asphyxiated neonates at the time of discharge in relation to the perinatal risk factors.

Materials and Methods

This prospective study was conducted on the term asphyxiated babies who were admitted in NICU of ASRAM medical college, Eluru, AP, India during the period of January 2013 to August 2014 .

Study design: A Descriptive retrospective history was taken for all the term babies with perinatal asphyxia admitted from January 2013 to August 2014 at the neonatal ICU of ASRAM medical college, Eluru. Total number of cases 65, were included in the study using the following inclusion and exclusion criteria.

Inclusion criteria:

- All the term babies with the history of perinatal asphyxia who were admitted to ASRAM hospital,

including inborn and outborn neonates.

- The study includes full term newborns having a clinical history consistent with either of the following.
 1. Perinatal asphyxia by 5 minute APGAR score <5 [8]
 2. Failure to initiate or sustain respiration after birth [1]
 3. Clinical post asphyxial syndrome (encephalopathy, seizures).

Exclusion criteria :

- Babies who were born with congenital anomalies, progressive metabolic diseases, brain malformations, acquired central nervous system infections [9].
- Babies who have left the hospital without continuing the treatment completely.
- Babies having low APGAR scores for other reasons like as follows: – Birth weight <1500gms, prematurity, cyanotic congenital heart diseases, congenital infections were excluded.

Consent: Informed written consent will be obtained from a parent after a full verbal and written explanation of the study. The attending physician will explain parents during the intervention period to ensure that they understand the study procedures and continue to consent to participate in the study. After consent and enrollment their detailed history including peri-natal history, APGAR score, resuscitation measures, problems and outcome were recorded through a structured questionnaire on a pre-designed study proforma. Clinical examination of all the admitted term asphyxiated babies were done. The evaluation was done including the general examination such as anthropometry, signs and stages of hypoxic ischemic encephalopathy (HIE) as proposed by sarnat and sarnat staging were assessed. According to this classification.

1. HIE stage 1 (Mild) includes irritability, hyperalertness, normal tone, strong moro's reflex, mydriasis.
2. HIE stage 2 (Moderate) includes lethargy, seizures, marked abnormalities of tone and requirement of tube feeding.
3. HIE stage 3 (Severe), comatose, prolonged seizures, severe hypotonia and failure to maintain spontaneous respiration.

The early outcome were recorded after 72 hours of admission it was measured as clinical improvement, death and/ presence of HIE stage I, II, III. At the time of the discharge the outcome has been assessed by seizure control, feeding pattern, and clinical neurological evaluation. Babies were been divided into good and poor outcomes based on the following criteria.

Good- Those babies with no feeding difficulties and taking breast feeds, having seizures controlled well or baby being on single AED at the time of discharge and neurologically normal clinical assessment.

Poor- those babies with feeding difficulties like baby on spoon /tube feeds, having refractory seizures or seizures controlled with 2 or more AED's at the time of discharge and abnormal neurological clinical assessment.

Ethical issues and statistical analysis methods:

Approval for the study has been obtained from the ASRAM medical college Ethics Committee. Ethics committee clearance certificate has been issued.

All the data were been taken from the history and the consent has been taken from the parents. The complete data has been kept in the form of a master sheet in the Microsoft word excel 2013 format and the statistical data tables were proceeded using the SPSS 17.0 version software.

Results

Totally 451 neonates were admitted in the NICU of ASRAM medical college during the study period in which 70 (15.5%) neonates were noted to be term asphyxiated newborns. Males were more in number in the study showing that 40 (61.5%) and female neonates 25 (38.5%) in number. Both the sexes have an almost equal percentage of deaths and the prognostication with 7.5% deaths in male babies and 8% deaths in female neonates. HIE neonates were 65 in number, in which 53.84% have good prognosis, 38.46% poor prognosis and 7.69% died. Neonates born through NVD or through LSCS have an almost equal prognostication showing the death percentages as 7.5% in LSCS deliveries and 7.9% in normal deliveries, 55% babies born through NVD have good prognosis, and 36.8% have poor prognosis. 51% babies born through LSCS deliveries have good prognosis and 40.7% have poor prognosis. Neonates born with meconium staining or without meconium staining have an almost equal prognostication showing an insignificant p value. Death percentages were all most equal in both with 8% and 7.5%. Neonates born with meconium staining have 40% of poor prognosis and 52% good prognosis. Neonates without meconium staining have 37.5% poor prognosis and 55% good prognosis.

Table 1: Relation of the maternal gravida to prognosis of the neonates.

Prognosis	Gravida				
	Primigravida		Multigravida		Total
	No	%	No.	%	No
Good	27	50.9%	8	66.7%	35
Poor	21	39.6%	4	33.3%	25
Death	5	9.4%	0	0%	5
Total	53		12		65

50.9% neonates born to primigravida mothers have good prognosis and the remaining 39.6% have poor prognosis, and 9.4 % of neonates died. 67% neonates born to multigravida mothers have good prognosis and 33% have poor prognosis and no deaths occurred.

Table 2: Relation of the cord around the neck to prognosis of the neonates.

Prognosis	Cord around the neck of the neonates						
	Yes (twice)		Yes (once)		No		Total
	No	%	No	%	No	%	No
Good	0	0%	1	25%	34	61.8%	35
Poor	5	83.4%	3	75%	17	31%	25
Death	1	16.6%	0	0%	4	7.2%	5
Total	6		4		55		65

Pearson Chi-Square Tests: Chi-square Value is 11.287 for 4 d. f at 5% L.O.S and P – Value is 0.024 (Significant) Out of all neonates with cord entangled twice around the neck 83.4% have poor prognosis and death have been noticed in 16.6% cases. Out of neonates with cord entangled once around the neck 75% have poor prognosis, 25% have good prognosis.

Out of all neonates without any cord around the neck 31% have poor prognosis, 61.8% have good prognosis and 7.2% cases died. The 4 neonates which were having no cord entanglement, and having the Apgar score <3 at 10 mins have expired within 24 hours of life after admission.

Table 3: Relation of APGAR score timing to the prognosis of the neonates.

Prognosis	APGAR Scoring at 5minutes						
	<3		<5		>5		Total
Good	0	.0%	0	.0%	35	100.0%	35
Poor	0	.0%	25	100.0%	0	.0%	25
Death	5	100.0%	0	.0%	0	.0%	5
Total	5		25		35		65

Pearson Chi-Square Tests: Chi-square Value is 130.00 for 4 d. f at 5% L.O.S and P- Value is 0.000 (Highly Significant).

APGAR scoring has a very good value in the study showing as a good indicator for the prognosis of the neonate. The neonates born with APGAR score < 3 at 5 mins have 100% deaths and the neonates born with the APGAR score between 3 to 5 at 5mins have an 100% poor prognosis and the neonates born with APGAR score > 5at 5mins have 100% good prognosis.

The neonates included under stage 1 have 94.5% good prognosis and 5.5% poor prognosis. Neonates included in the stage 2 were having an equal percentages 47.4% good and poor prognosis and death percentage of 5.2%. On a overall view, 33.3% babies with stage 3 died and 66.7% have poor prognosis.

The neonates in which the AED's were continued at the time of discharge, 59.5% have poor prognosis and 40.5% have good prognosis .And in the neonates where the AED's were not continued, 100% have good prognosis.

The ventilation requirement in the HIE neonates with a central cause has shown that 54.6% neonates have a poor prognosis and 22.7% with death and the remaining 22.7% with a good prognosis. The neonates who do not require ventilator support have 69.7% of good prognosis and only 30.3% of poor prognosis and no deaths noticed.

Table 4: Relation with presence of Pediatrician to deaths due to asphyxia in neonates.

Prognosis	Pediatric Assistance				Total
	Yes		No		
	No	%	No	%	No
Death	1	20%	4	80%	5

Pearson Chi-Square Tests: Chi-square Value is 6.476 for 2 d.f at 5% L.O.S and P – Value is 0.039 (Significant). When there is a pediatrician at the time of delivery only 2.6% of deaths were noticed but when a pediatrician is not available then death percentage was 15.5%.

Discussion

No exact statistics are available on perinatal asphyxia and its complications in India. In our study, 15.5% of infants at our neonatal service were diagnosed with asphyxia during the 1year period. Similar results have been observed in other study [10]. Our result concluded gender was not a risk factor to affect the prognosis in asphyxiated newborn. Primigravida was a risk factor for poor prognosis as described in a study by a study in

Saudi Arabia [11]. Mode of delivery did not affect the outcome. Another study performed by Agarwal et al shows that modes of delivery did not affect the progression to different stages of HIE in neonates with perinatal asphyxia [12]. Cord around the neck was a definite risk factor for poor prognosis. Twice around the neck was also responsible for more no of deaths in compared to no cord around the neck. Even though cord around the neck are common and occur 25% -35% of

the time rarely a neonates cord will be wrapped so tightly around their neck that their body is compressed and oxygen delivery to the neonate is compromised. When this occurs, a caesarean is prudent and in its absence, perinatal asphyxia/death could occur. Cords around the neck mostly are of single and are loosely coiled and less commonly they are tightly coiled. Mercer et al study shows that cord around the neck of 10%-37% of births, shown to be having short term morbidity. Although studies have shown a clear evidence that not cutting a tight cord around the neck before, or immediately after birth can result in serious brain injuries and even death [13,14,15].

Meconium staining does not affect the outcome. Similar results also have been described by various studies [16,12].

The present study describes that any neonates born with an APGAR score of <3 at 5min have 100% mortality occurrence and if APGAR score of 3- 5 have 100% poor prognosis. The neonate with APGAR score of >5 have 100% good prognosis. Similarly, Nagdyman et al. found that one- and five-minute APGAR scores of patients with asphyxia were statistically significantly lower than those of control group [17]. The APGAR scoring system has been established as an important predictor of prognosis in asphyxia cases.

It was coincident with a high neonatal encephalopathy grade, low Apgar scores at 5 minutes, early neonatal seizures, and necessity of antiepileptic drug therapy. These clinical variables maintain a close relationship with the cases in this sample with unfavorable outcomes and hypoxic-ischemia as the etiologic factor.

All the HIE neonates in the present study are staged into 4 parameters based on Sarnat and sarnat staging clinically, than those staged neonates are related with the prognosis of the neonates. The neonates with stage I have good prognosis and the neonates which were staged under stage 2 and stage 3 have a higher incidence of poor prognosis and deaths.

Ventilator requirement has been a poor prognostic factor in outcome of HIE. Mortality as well as morbidity has been seen more in ventilated babies. Some studies have reported similar results [18].

The number of AED's used in the neonates for controlling the seizures also decide the prognosis of the neonates. The neonates with the early usage of AED's

have a good prognosis. Usage of multiple AED's in neonates have poor prognosis. Usage of three AED's in a neonates with controlled seizure has higher mortality and morbidity. The neonates in which an AED is not used and when there is no clinical appearance of seizures those neonates have good prognosis.

The present study shows that how important a pediatrician presence for a neonatal resuscitation, showing a varied change in prognosis of the neonate. The death percentage in the absence of the pediatrician for a neonatal resuscitation is 80% and in the presence of pediatrician it is only 20%.

A study conducted in Thailand shows that the presence of a Paediatrician during the neonatal resuscitation has shown the importance in prognosis of neonates as in our study [10].

Conclusions

In conclusion, we can take necessary preventive measures to reduce incidence of perinatal asphyxia. We think, paediatrician presence at the time of the neonatal resuscitation will improve the outcome. Low APGAR score and cord around neck are two bad prognostic factors in the outcome of perinatal asphyxia.

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