ORIGINAL RESEARCH PAPER
Volume-9 | Issue-2 | February-2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY ON NEURODEVELOPMENTAL OUTCOME IN INFANTS WITH HYPOXIC ISCHEMIC ENCEPHALOPATHY

Paediatrics

Dr. Chaitanya Arsi Postgraduate Department Of Pediatrics, Alluri Sitarama Raju Academy Of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005 India

Dr. Premchand Surasura* Postgraduate Department Of Pediatrics, Alluri Sitarama Raju Academy Of Medical Sciences Eluru, West Godavari District Andhra Pradesh 534005 India *Corresponding Author

ABSTRACT

BACKGROUND: To assess the neurodevelopmental outcome in term neonates with Hypoxic ischemic encephalopathy up to one year of age.To assess the relationship between severity of Hypoxic Ischemic Encephalopathy and neurodevelopmental outcome. To assess the neurodevelopmental outcome by DASII (Development Assessment Scale for Indian Infants) at the age of 1 year.

PATIENTS AND METHODS: This study was conducted in a tertiary care hospital, ASRAM,Eluru.It is a hospital based prospective analytical study conducted on 150 term neonates with HIE admitted in NICU from September 2017 to September 2019. Follow up of these infants done in OPD at 3 ,6,9,12 months. Tone assessment done by Amiel Tison angles.At each visitanthropometricmeasurements,developmental milestones were noted.Neurodevelopmentaloutcomel assessed by DASII at the age of one year.

RESULTS: Incidence of abnormal neurodevelopmental outcome was 22.6%, tone abnormality 20.6%, Seizures 22%, moderate sensorineural hearing loss 1.4%, vision abnormalities 2 % in HIE infants. There was a significant statistical correlation between the decrease in head circumference and severity of HIE during 6th, 9th, 12th month follow up visit (p 0.001).There was significant statistical association between tone abnormality and severity of HIE during follow up.

CONCLUSION: Head circumference and tone abnormality helps to predict developmental outcome on follow up. Early detection of abnormal neurodevelopment so that early intervention could be initiated to decrease the morbidity in infants with Hypoxic ischemic encephalopathy.

KEYWORDS

Hypoxic Ischemic Encephalopathy, Dasii, Amiel Tisonangles, Neuro Developmental Outcome, Early Intervention.

INTRODUCTION:

Perinatal asphyxia is one of the leading causes of morbidity among children.[1]Perinatal asphyxia is an interruption of blood flow and gas exchange to the fetus in the perinatal period. If significant it triggersa cascade of neuronal injury ,leading to neonatal encephalopathy termed hypoxic ischemic encephalopathy.[2] Cerebral palsy, microcephaly, global developmental delay, seizure disorder is some of the neurological sequelae following hypoxic ischemic encephalopathy.[3] Neurodevelopmental assessment in the first year of life is important for determining the presence or absence of brain damage. By thorough assessment and follow up of asphyxiated babies, neurodevelopmental abnormalities can be identified early and subject for early intervention, thuslong-term morbidity can be minimized.

AIMS OF STUDY:

To assess the neurodevelopmental outcome of infants with Hypoxic Ischemic Encephalopathy. To assess the relationship between severity of Hypoxic Ischemic Encephalopathy and neurodevelopmental outcome. To assess the neurodevelopmental outcome by DASII (Dev elopment Assessment Scale for Indian Infants) at the age of 1 year.

STUDY DESIGN: Hospital based Prospective analytical study.

SAMPLE SIZE: 150 infants.

STUDYPERIOD: September 2017 - September 2019

INCLUSION CRITERIA :

Neonates completed 37 weeks of gestation Inborn babies with Apgar score < 7 at 5 min out born babieswith history of asphyxia 1. H/O delayed first cry more than 5 minutes 2. Need for positive pressure ventilation more than 1 minute. 3.H/o seizures following delayed cry.Inborn and out born babies Showing clinical signs of HIE as per sarnat and sarnat staging.

EXCLUSION CRITERIA:

Preterm, Perinatal infection, Congenital anomalies, suspected metabolic disorders, Infants lost during follow up.

PATIENTS ANDMETHODS:

Study conducted on 150 term neonates with HIE admitted in NICU of a tertiary care hospital ASRAM Eluru. After taking the informed written consent from the parent or guardian, the relevant information regarding pregnancy, delivery and neonatal period was collected from the parents and neonatal records and recorded in a predesigned prof orma. At enrollment detailed history and neurological examination was done to detect neurological deficits and tone abnormalities. All infants with HIE were screened in OPD at 3, 6, 9 and 12 months of age. At each follow up 1. Neurological examination using Amiel-Tison angles at 3, 6, 9 and 12 months of age. 2. Growth assessment (detailed anthropometry) and developmental milestones during follow up at3,6,9,12 months of age. 3.To assess the neurodevelopmental outco me at the age of one year by DASII.

DEVELOPMENTAL ASSESSMENT SCALE FOR INDIAN INFANTS (DASII)

This is the gold standard test used for developmental evaluation, developed by Pramila Pathak, and is based on Bayley Scales of Infant Development (BSID). Both mental development index andpsychomotor development index can be calculated by DASII. The age placement of the item at the total score of the scale is noted as the child's developmental age. This gives child's total scores to his motor age (MoA) and mental age (MeA). The respective ages are used to calculate his motor and mental development quotients respectively by comparing them with his chronological age and multiplying it by 100.

(DMoQ = MoA/CA x 100 and DMeQ = MeA/CA x 100).

The composite development quotient (DQ) is derived as an average of DMoQ and DMeQ. The test needs a special kit and cooperation of the child.

At 12 months of age all the babies will be assessed using Developmental Assessment Scales for Indian Infants (DASII). Abnormal neurodevelopmental outcome is MoQ or MeQ of less than 70% on DASII.

STATISTICALANALYSIS

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using" SPSS v16 software. Using this software range, frequencies, percentages, means, standard deviations, chi square and p values were calculated. Kruskal Wallis chi square test was used to test the significance of difference between quantitative variables. A p value less than 0.05 is taken to denote significant relationship.

RESULTS:

Out of 150 infants, 98(65.3%) were male and 52 (34.6%) were female infants. Out of the 150 infants,38 (25.3 %) had HIE I, 95(63.3 %) had HIE II and 17(11.3%) had HIE III. Out of the 38 HIE I babies, 23 (60.5

%) were males and 15 (39.5 %) were females. Out of the 95 HIE II babies, 68 (71.6 %) were males and 27 (28.4%) were females. Out of the 17 HIE III babies, 7 (41.2 %) were males and 10 (58.8 %) were females. Out of 150 HIE babies, 100 (66.6%) were delivered by primigravida mothers and 50 (33.3%) were delivered by multigravida mothers.

Out of 150 HIE cases, 60(40%) had no antenatal risk factors. Other 90(60%) cases had antenatal risk factors. Among the antenatal risk factors Gestationaldiabetes mellitus in 10 cases (6.6%), Meconium stained liquor in 42 cases (28%), Pregnancy induced hypertension in16 cases (10.6%) ,Antepartum hemorrhage in 4 cases (2.6%) ,Oligohydramnios in 12 cases(8%) ,Cord prolapse in 2 (1.3%) cases and Premature rupture of membranes in 4 (2.6%) cases.

Out of total 150 newborns 70(46.5%) werein born and 80 were (53.5%) out born. Out of 150 total HIE cases, 111 (74%) cases were delivered by normal delivery, 9(6%) cases were delivered by AVD,30 (20%) cases were delivered by LSCS.

ASSOCIATION BETWEEN TONE AND SEVERITY OF HIE AT DISCHARGE AND DURING FOLLOW UP USING AMIEL TISON ANGLES

Tonen (%)			HIE-1	HIE-2	HIE-3	P-Value
At Dischatge	Normal	118(78.6)	37(97.4)	78(82.1)	3(17.6)	0.001
	Abnormal	32(21.3)	1(2.6)	17(17.9)	14(82.4)	
3 Months	Normal	121(80.6%)	37(97.4)	80(84.2)	4(23.5)	0.001
	Abnormal	29(19.3%)	1(2.6)	15(15.8)	13(76.5)	
6 Months	Normal	118(78.6%)	37(97.4)	77(81.1)	4(23.5)	0.002
	Abnormal	32(21.3%)	1(2.6)	18(18.9)	13(76.5)	
9 Months	Normal	119(79.3%)	37(97.4)	78(82.1)	4(23.5)	0.001
	Abnormal	31(20.6%)	1(2.6)	17(17.9)	13(76.5)	
12 Months	Normal	119(79.3%)	37(97.4)	78(82.1)	4(23.5)	0.001
	Abnormal	31(20.6%)	1(2.6)	17(17.9)	13(76.5)	

Among the 150 HIE babies, 118 (78.6%) had normal tone and 32 (21.3%) had abnormal tone at the time of discharge and there is significant association between severity of HIE and tone abnormality. A significant association (P value 0.001) was found between tone abnormality and severity of HIE during 3rd month follow up. A significant association (P value 0.002) was found between tone abnormality and severity of HIE during 6th month follow up. A significant association (P value 0.001) was found between tone abnormality and severity of HIE during 9th month follow up. A significant association (P value 0.001) was found between tone abnormality and severity of HIE during 12th month follow up.

ASSOCIATION BETWEEN HEAD CIRCUMFERENCE AND SEVERITY OF HIE DURING FOLLOW UP

Head Circumference (cm)		N	Mean	S. D	95% Confidence intervals		P value
					Lower bound	Upper bound	
3 months	HIE 1	38	38.4286	1.63780	36.9139	39.9433	0.894
	HIE 2	95	38.2455	1.73582	37.4758	39.0151	
	HIE 3	17	37.9600	1.51921	36.0737	39.8463	
6 months	HIE 1	38	41.3368	1.57350	40.8196	41.8540	0.001
	HIE 2	95	40.3084	2.14345	39.8718	40.7451	
	HIE 3	17	38.5706	2.49944	37.2855	39.8557	
9 months	HIE 1	38	42.8368	1.32674	42.4008	43.2729	0.001
	HIE 2	95	41.8274	2.22115	41.3749	42.2798	
	HIE 3	17	39.9294	2.86308	38.4574	41.4015	
12 months	HIE 1	38	44.3079	1.43854	43.8351	44.7807	0.001
	HIE 2	95	43.2684	2.34186	42.7914	43.7455	
	HIE 3	17	41.2118	3.57996	39.3711	43.0524	

During the 3rd month follow up a significant statistical difference (P value 0.894) was not found between head circumference and severity of HIE.

During the 6th month follow up the mean head circumference of HIE 1, HIE 2, HIE 3 infants was 41.3cm, 40.3cm ,38.5 cmrespectively. A significant statistical difference (p value 0.001) was found between decrease in head circumference and severity of HIE.During the 9th month follow up the mean head circumference of HIE 1, HIE2, HIE 3 infants was 42.8cm, 41.8cm ,39.9cm respectively. A significant statistical difference (p value 0.001) was found between decrease in head circumference and severity of HIE. During the 12th month follow up, the mean head circumference of HIE 1, HIE2, HIE 3 infants was 44.3cm, 43.2 cm ,41.2cm respectively. A significant statistical difference (P value 0.001) was found between decrease in head circumference and severity of HIE.

There is no significant difference between the mean weight, length of infants and severity of HIE in our study population.

ASSOCIATION BETWEEN SEVERITY OF HIE AND DEVELOPMENTAL DELAY IN DASII AT THE END OF FOLL OW UP (12 MONTH)

VARIABLE		N (%)	HIE STAGING			P value
			HIE-1	HIE-2	HIE-3	
DASII	NORMAL	116(77.3)	37(24.6)	78(52)	1(0.6)	0.001
	ABNORMAL	34(22.7)	1(0.6%)	17(11.3)	16(10.6)	

At the age of one year Among the 38 HIE I infants, 37 (24.6%) found to be normal and1(0.6%) found to be abnormal. Among the 95 HIE II infants, 78 (52%) found to be normal and 17 (11.3%) found to be abnormal. Among the 17 HIE III infants, 1 (0.6 %) found to be normal and 16 (10.6 %) found to be abnormal. A significant statistical association (P value 0.001) was found between severity of HIE and developmental delay as per DASII at the end of 1 year follow up.

Hypoxic ischemic encephalopathy (HIE) is known to be associated with significant morbidity and mortality in the full-term infant.Incidence of abnormal neurodevelopmental outcome was 22.6%, tone abnormality 20.6%, Seizures 22% ,moderate sensorineural hearing loss 1.4% ,vision abnormalities 2 % in HIE infants.

DISCUSSION:

Hypoxic ischemic encephalopathy is associated with significant mortality and morbidity in a full-term infant.This study was conducted to assess neurodevelopmental outcome in term neonates withHIE and their outcome in relationship with the severity of HIE. During the study period from September 2017 to September 2019, 150 HIE infants were followed. Among them more than half of the infants had HIE II and one third of the infants had HIE I and remaining were HIE III. The number of male infants were proportionately high in HIE I and HIE II and female infants are more in HIE III. We also observed that there was no significant statistical correlation with weight and length of the HIE infants and the severity of HIE.

There was a significant statistical correlation between the decrease in head circumference and severity of HIE during 6th, 9th, 12th month follow up visit. This correlates with Charlene et al [3],Mercuri et al [4] who stated that a decrease of head circumference growth in the early months, as determined by serial measurements, is associated with adverse outcome. We found out a significant statistical association between tone abnormality and severity of HIE at discharge and 3rd, 6th, 9th, 12th month follow up visit. In a study conducted by Elenjickal et al [5] correlation between tone abnormality anddevelopmental delay was highly significant.Incidence of abnormal neurodevelopmental outcome was 22.6%, tone abnormality 20.6%, Seizures 22%, moderate sensorineural hearing loss 1.4%, visionabnormalities 2 %of infants. In a study conducted by Nazeer s et al [6]the incidence of abnormal neurodevelopmental outcome was 14%. In a study conducted by Sekela D et a[7]abnormal outcome in 29.3%.

By DASII, 0.6% of HIE 1 ,11.3% HIE 2 and 10.6% HIE3infants, had developmental delay (DQ < 70). In the present study abnormal neurodevelopmental outcome in 22.6% HIE infants. HIE 1 had normal outcome where as 11.3 % HIE 2 and 10.6 % HIE 3 had abnormal outcome.

A study conducted by Hassan et al[8]indicated a statistically significant association between the severity of HIE and long-term prognosis in infants.

CONCLUSION:

Incidence of abnormal neurodevelopmental outcome was 22.6%, tone abnormality 20.6%, Seizures 22%, moderate sensorineural hearing loss 1.4%, visionabnormalities 2 % in HIE infants.Head circumference and tone abnormality helps to predict developmental outcome on follow up. Early detection of abnormal neurodevelopment so that early intervention could be initiated to decrease the morbidity in infants with

Hypoxic ischemic encephalopathy.

REFERENCES:

1. Ekwochi U, Ndu IK, Nwokoye IC, Ezenwosu OU, Amadi OF, Osuorah DI. Pattern of morbidity and mortality of newborns admitted into the sick and special care baby unit of Enugu State University Teaching Hospital, Enugu state. Nigerian journal of clinical practice. 2014;17(3):346-51.
2. Ahearne CE, Boylan GB, Murray DM. Short- and long-term prognosis in perinatal asphyxia: An update. World journal of clinical pediatrics. 2016 Feb 8;5(1):67.
3. Robertson CM, Perlman M. Follow-up of the term infant after hypoxic-ischemic encephalopathy. Pediatrics & child health. 2006 May 1;11(5):278-82.
4. Mercuri E, Ricci D, Cowan FM, Lessing D, Frisone MF, Haataja L, Counsell SJ, Dubowitz LM, Rutherford MA. Head growth in infants with hypoxic–ischemic encephalopathy: correlation with neonatal magnetic resonance imaging. Pediatrics. 2000 Aug 1;106(2):235-43.
5. Elenjickal MG, Thomas K, Sushamabai S, AHAMED Z, SHEIK K. Development of High-Risk Newborns--A Follow-up Study from Birth to One Year. Indian pediatrics. 2009 Apr 1;46(4).
6. Senthil Kumar K. Neurodevelopmental outcome of babies with hypoxic ischemic encephalopathy. International Journal of Research in Medical Sciences. 2017 Jul;5(7):3197.
7. Mwakyusa SD, Manji KP, Massawe AW. The hypoxic ischemic encephalopathy score in predicting neurodevelopmental outcomes among infants with birth asphyxia at the Muhimbili National Hospital, Dar-es-Salaam, Tanzania. Journal of tropical pediatrics. 2009 Feb 1;55(1):8-14.
8. Boskabadi H, Ashraf Zadeh F, Doosti H, Zakerihamidi M. Assessment of risk factors and prognosis in asphyxiated infants. Iranian journal of pediatrics. 2015 Aug;25(4).