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Original Research Article

A Study on Clinical Profile of Neonatal Seizures with Special Reference to Biochemical Abnormalities in NICU

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Abstract

Background and Objectives: Neonatal seizures are clinically significant because very few are idiopathic. Biochemical disturbances occur frequently in neonatal seizures either as an underlying cause or as associated abnormalities. In their presence it is difficult to control seizures and there is a risk of further brain damage. To assess the importance of biochemical abnormalities in neonatal seizures and to evaluate the clinical profile, time of onset and its relation to etiology of neonatal seizures.

Methodology: The present study included 110 neonates presenting with seizures admitted to NICU of DMCH, Laheriasarai. Detailed antenatal, natal and postnatal history were taken and examination of baby was done and HIE staged according to modified Sarnat's staging. Relevant investigations including biochemical parameters were done and etiology of neonatal seizures and their associated biochemical abnormalities were diagnosed.

Conclusion: Biochemical abnormalities are common in neonatal seizures. Isolated biochemical abnormalities without other co morbid states were seen in 13 (11.8%) cases. 33 (30%) cases of neonatal seizures with identifiable etiology had associated biochemical abnormalities.

Keywords: Neonatal seizures, Hypoglycemia, Hypocalcaemia, Hypomagnesemia, Hypoxic ischaemic encephalopathy.

Introduction

Neonatal seizures represent the most distinctive signal of neurological disease in the newborn period. The convulsive phenomenon are the most frequent of the overtmanifestation of neonatal neurological disorders and they are clinically significant because very few are idiopathic. Neonatal seizures differ considerably from seizures observed in older children, principally because the immature brain is less capable of propagating generalized or organized electrical discharges. Since neonatal seizures have an adverse effect on neurodevelopment and can predispose to cognitive and behavioural epileptic complications later in life, prompt diagnostic and therapeutic plans are necessary.

It is critical to recognize neonatal seizures to determine their etiology and to treat them for 3 major reasons:

1. First, seizures are usually related to significant illness, sometimes requiringspecific therapy.
2. Second, neonatal seizures may interfere with important supportive measures, such as alimentation and

assisted respiration for associated disorders.

3. Third, experimental data give reason for concern that the seizures per se may be a cause of brain injury.

Seizures present with varying manifestations like generalized tonic, multifocal clonic and subtle activity. Therefore it is important to recognize them and treat it, as delay in recognition and treatment may lead to brain damage. The time of onset of seizure has relationship with the etiology and prognosis. For example, birth asphyxia usually presents in the first three days of life whereas meningitis presents after first week. If the baby convulses within hours of delivery, it signifies poor prognosis and brain damage. The presence of seizure does not constitute a diagnoses but it is a symptom of an underlying central nervous system disorder due to systemic or biochemical disturbances. Biochemical disturbances occur frequently in the neonatal seizures either as an underlying cause or as an associated abnormality. In their presence, it is difficult to control seizure and there is a risk of further brain damage. Among metabolic causes hypoglycaemia, hypocalcaemia, hypomagnesemia, and hyponatremia are commonly seen. Early recognition and treatment of these biochemical disturbances is essential for optimal management and satisfactory long term outcome.

Taking above points into consideration, the study on clinical profile of neonatal seizures with special reference to biochemical abnormalities has a significant role.

Objectives

To assess the biochemical abnormalities in neonatal seizures.

To evaluate the clinical presentation, time of onset and its relation to etiology of neonatal seizures.

Materials and methods

The present study included 110 neonates presenting with seizures admitted to NICU of Darbhanga Medical College and Hospital Laheriasarai, Bihar. Study duration of Two years.

Inclusion Criteria

Neonates (first 28 days of life) presenting with at least one of the following clinical type of seizures:

Generalized tonic seizures.

Multifocal clonic seizures

Focal clonic seizures

Myoclonic seizures

Neonates with seizures who were delivered at our hospital as well as outborn babies were included in the study.

Exclusion Criteria

Neonates with isolated subtle phenomenon, apnea or paroxysmal autonomic changes, i.e., only subtle motor moments or apnea without tachycardia were excluded from the study.

Jitteriness in neonates.

Tetanic spasms in neonates.

Detailed antenatal, natal and post natal history were taken as per the proforma enclosed.

Age & parity of mother were noted. History of whether regular antenatal checkups were done or not was enquired. History of medical illness like diabetes, fever during first trimester or third trimester were asked. History of obstetric complications like PIH, eclampsia, antepartum hemorrage, oligo or polyhydramnios were taken.

Perinatal History: History of PROM, prolonged second stage of labour, Meconium staining of liquor, place of delivery, type of delivery and indication for forceps and caesarean section, were enquired. After delivery whether baby cried immediately or not, was it meconium stained and any resuscitation done, were enquired. If Apgar score was done, it was

noted. The neonate was diagnosed with birth asphyxia if baby did not cry for more than three minutes after birth or documented apgar score was ≤ 3 at one minute and <7 at 5 minutes of birth. Post-natal History: History of lethargy, poor feeding, jaundice, excessive cry, fever, vomiting and seizures were taken. Complete blood count (hemoglobin, Total count, differential count).

Sepsis screening: Peripheral smear for band cells and toxic granules, CRP and blood culture.

Blood glucose: Random blood sugar was done urgently with glucostick and then confirmed by glucose oxidase method. Hypoglycemia was diagnosed if RBS is less than 40 mg / dL.

Chest X-ray: Chest x-ray was done to rule out meconium aspiration syndrome and respiratory distress syndrome.

Ultrasound of cranium: was done in all babies with neonatal seizures to rule out intracranial hemorrhage, hydrocephalus, congenital anomalies of brain and infarction.

CT Scan and MRI Brain; CT scan or MRI brain was done as & when necessary.

EEG: was done as and when required.

Results

There were 110 neonates admitted to NICU of DMCH Laheriasarai during the period of Two years. with neonatal seizures.

Table 1: Distribution of Neonatal Seizures according to gestational age

Gestation of age	No. of cases	%
Term appropriate for gestational age	89	80.9
Term Small for gestational age	11	10.0
Pre term	8	7.3
Post term	2	1.8
Total	110	100.0

In the present study, out of 110 babies 100 were full term, of which 89 (80.9%) were AGA and 11 (10%) SGA. There were 8(7.9%) preterm and 2 (1.89%) postterm babies.

Table 2: Sex-wise distribution of neonatal seizures

Gender	No. of cases	%
Male	70	63.6
Female	40	36.4
Total	110	100.0

In our study, 70 (64%) were males and 40(36%) were female babies withmale to female ratio of 1.7:1.

Table 3: Place of delivery of babies with neonatal seizures

Place of Delivery	No. of cases	%
Home	4	3.6
Hospital	106	96.4
Total	110	100.0

Out of 110 cases, 4 (3.6%) were born at home and 106 (96.4%) were hospitaldeliveries.

Table 4: Inborn/Outborn of patients studied

Inborn/Outborn	No. of cases	%
Inborn	59	53.6
Outborn	51	46.4
Total	110	100.0

Of the 110 newborns with seizures 59(53.6%)were inborn babies and 51(46.4%) were outborn babies referred to our NICU.

Table 5: Birth weight of babies with seizures

Birth weight(kg)	No. of cases	%
≤1	0	0.0
1-2	15	13.6
2-2.5	23	20.9
>2.5	72	65.5
Total	110	100.0

In the present study, 72 (65.5%) were >2.5 kg, 23 (20.9%)between 2 and 2.5 kg,15 (13.6%) between 1 and 2 kg and 0 cases < 1 kg.

Table 5: Type of seizures

Type of Seizures	No. of patients(n=110)	%
Subtle	52	47.3
Focal clonic	21	19.1
Multifocal clonic	15	13.6
Generalized tonic	12	10.9
Subtle+GTS	6	5.5
Subtle+Clonic	4	3.6
Total	110	100

In our study, 52 (47.3%) had subtle, 12 (10.9%) generalised tonic, 15 (13.6%) multifocal clonic, 21(19.1%) focal clonic, 6 (5.5%) subtle with GTS and 4(3.6%) subtle with clonic. Most common seizures were subtle seizures.

There were 13 (11.8%) pure metabolic seizures in our study. In preterm, 2 (22.2%) cases had hypoglycemia. In term AGA one had hypocalcemia, 1 had combined hypocalcaemia and hypomagnesemia, and 3(33.4%) had hypoglycemia. Two term SGA had hypocalcemia and 4(44.4%) SGA had hypoglycemia. of the 33 cases of non-metabolic seizures, which showed biochemical abnormality, hyponatraemia was most common abnormality with 13 (39.5%) cases.10(47.7%) were due to HIE and 3 (30%) cases due to neonatal meningitis. HIE was associated with hypomagnesemia in 2 (9.5%) cases, hypermagnesium in 1 (4.7%) cases and 10 (3.4%) of hyponatremia and5 (23.9%) cases hypoglycaemia. One (50%) case of ICH was associated with hypermagnesemia and 1 (50%)with hypomagnesemia Of the 10 cases of neonatal meningitis associated with biochemical abnormalities,5 (50%) cases were associated with hypoglycemia and 3 (30%) hyponatremia and 1 each of hypocalcemia and hypomagnesemia.

Discussion

In our study, out of 110 neonates with seizures, 100 (90.9%) were full term neonates, of which 90(81.9%) were appropriate for gestational age and 11(10%) weresmall for gestational age. Eight (7.3%) were preterm and two babies (1.8%) were post term babies. Majority of neonates with seizures in our study were full term babies and birth asphyxia was the commonest cause of seizures in full term babies and was associated with perinatal complications like MSAF in 23 cases and prolonged 2nd stage of labour in 13 cases. Similar observations were seen in a study by Moayedi AR et al. [1] where term AGA babies were 83.6% and preterm were 12.7% and post term 3.6%. Study by Ravneet Sandhu et al. [2] showed AGA babies 81.2% followed by preterm babies 18.8%

which is similar to our study. Sex Distribution: Neonatal seizures have no sex predilection. However, in our study, male to female ratio was 1.75:1, similar with the study of neonatal seizures by Moayedi AR et al. [1] where male to female ratio was 1.3:1. The study of neonatal seizures by Hasan Tekgul et al. [3] showed male to female ratio of 1.15:1. Birth weight In our study, 72 (65.5%) cases had birth weight >2.5 kg. 23 (20.9%) were between 2 and 2.5 kg and 15 (13.6%) between 1 and 2 kg. Study by Moayedi AR et al. also showed similar finding of 73.6% >2.5 kg and 22.7% were <2.5 kg. Type of delivery: In our study, majority of neonates with seizures were born by normal vaginal delivery 70(63.6%) followed by LSCS 35(31.8%) b and outlet forceps delivery 5 (4.5%). In a study of neonatal seizures by Lakhra Mahaveer et al. [4] 68.7% were born by normal vaginal delivery, 28.1% by LSCS and 3.1% by forceps delivery.

Day of onset of seizures: In our study, 61(55.5%) neonates out of 110 neonates with seizures had onsetwithin the first day of life. 13 (11.8%) on day 2 and 7 (6.4%) on day 3 of life i.e. 67%within 48 hours and 86.3% within 1 week. Fifteen (13.6%) neonates had lateon set seizures that is after 8 days of life to 28 days of life. In a study of neonatal seizures by Ajay Kumar et al. [5] 75% of seizure episodesoccurred before 115 hours of age and 57.8% developed seizure within first 48 hours of life. In a study of neonatal seizures by Ronen Gabriel et al.[6] onset of seizures on the first day of life was 36%, 64% had onset of seizures within first 48 hours and 83% within first week of life, which is similar to our study. In a study of neonatal seizures by Ajay Kumar et al.46.55% were subtle seizures and 21.55% were generalised tonic seizures. In a study of neonatal seizuresby Brunquell Philip J et al.[7] subtle seizures were the commonest occurring in 51% (27 of 53), followed by focal clonic (42%), multifocal clonic (30%) and GTS (23%) which is similar to our study. Lakra Mahaveer et al. [4] also reported that subtle seizures were the commonest. Moayedi AR et al also reported subtle seizures as the commonest seizure.

Birth asphyxia was the commonest cause of neonatal seizures also in studies by Soni Arun et al. [8] seen in 76.9% of cases and Ronen Gabriel et al seen in 40% of cases. According to most of the studies birth asphyxia is the commonest cause of neonatal seizures followed by infections or metabolic causes. Intracranial hemorrhage constitutes for a small percentage of seizures. At the end of first week, seizures are mostly due to neonatal meningitis which also extends to early second week and later. In a study of neonatal seizure by Rose Arthur L et al. [9], majority of babies with perinatal anoxia convulsed on first day of life (5/10 – 50%), hypoglycaemic neonates convulsed at the end of first week and early second week (9/13 – 69%) and babies with hypocalcaemia presented with convulsions during first and second day of life (6/28) and again during late first week and second week (19/28). According to study conducted by Gupta V et al. severe birth asphyxia occurred in 27% and 6.3% of babies with thick and thin meconium staining respectively. Birth asphyxiated babies developed seizures usually within first 72 hours and more so within first 24 hours and babies with seizures within 24 hours have poor prognosis. Finer MM et al. [10] showed that 48% of infants having seizures within 24 hours were significantly handicapped compared to 24% whose seizures began after 24 hours. Birth asphyxia is staged according to Sarnat as HIE-I, II and III and convulsions are common in HIE-II neonates. In our study, 97% of birth asphyxia hadHIE-II. In our study 33 (42.3%) babies with birth asphyxia had subtle seizures followed by generalised tonic seizures seen in 24 (31%) neonates, focal convulsionsare less likely because of diffuse cerebral involvement. In a study by Mizrahi EM Kellaway Peter [11], out of 38 asphyxiated babies, 12

(31.6%) had subtle seizures followed by tonic seizures in 7 (18%). Tushar Parikh B et al. showed that late onset meningitis is more common than early onset meningitis. Study conducted by Kumar et al. and Arvind Sood et al. [12] showed that biochemical abnormalities were seen in cases of HIE, intracranial bleed and infections which is similar to our study. Kumar et al. [13] showed hyponatremia as most common biochemical abnormality in HIE and hypomagnesemia in 2 cases and hypoglycaemia in 4 cases. But study by Arvind Sood et al. Showed HIE, hypoglycaemia as commonest abnormality followed by hypocalcaemia, hypomagnesemia and hyponatremia. CNS infections in our study were associated with hyponatremia in 3 cases, 5cases of hypoglycemia and 1 case of hypocalcaemia and 1 case of hypomagnesemia. Kumar et al. also showed similar findings while Arvind et al. showed that intracranial infections were associated with hypocalcaemia and hyponatremia in 2 cases each. One Term AGA baby born of LSCS presented with seizures on day one of life antenatal scan had shown features suggestive of neuronal migration disorder but MRI-scan done on day two of life showed partial agenesis of corpus callosum whichis a rare cause of intractable seizures.

Conclusion

The recognition of the etiology for the neonatal seizures is often helpful with respect to prognosis and treatment. The most common etiology for neonatal seizures is hypoxic ischaemic encephalopathy. HIE is frequently associated with perinatal complications like prolonged second stage of labour, MSAF and unsafe home deliveries. Most of these are preventable if proper antenatal and perinatal care isgiven. The time of onset of neonatal seizures, is significantly associated with the etiology (e.g. onset of seizures within first three days is significantly associated with birth asphyxia). Subtle seizures are commonest type of clinical seizure, which is difficult to identify, therefore careful observation of at risk newborns is necessary for the diagnosis.

References

1. Moayedi AR, Zakeri S. Neonatal seizure: Etiology and type. J Child Neurology. 2007;2:23-6.
2. Sandhu Ravneet et al. A clinical study of seizures in neonates. In: Abstracts XXXX National Conference of the Indian Academy of Pediatrics, Shah NK, Agrawal R, Yewale V, eds. Mumbai; 2003 Jan 2nd to 5th: 209- 10.
3. Hasan Tekgul, Kimberlee Gauvreau. The current etiologic profile and neurodevelopmental outcome of seizures in term newborn infants. Pediatrics. 2006 Apr;117:1270-8.
4. Lakra Mahaveer, Vilhekar KY, Chaturvedi Pushpa. Clinico-biochemical profile of neonatal seizures in a rural medical college. In: Fernandez A, Dadhich JP, Saluja S, Editors, Abstracts, XXIII Annual Convention of National Neonatology Forum, Dec. 18-21, 2003; Hyderabad. 2003:121-122.
5. Ajay Kumar, Ashish Gupta. Clinico-etiological and EEG profile of neonatal seizures. Indian Journal of Pediatrics. 2007 Jan;74:33-7.
6. Ronen Gabriel M, Penny Sharon RN, Andrews S Wayne. The epidemiology of clinical neonatal seizures in newfound land: A population-based study. The Journal of Pediatrics. 1999 Jan;134(1):71-5.
7. Brunquell Philip J et al. Prediction of outcome based on clinical seizures type in newborn infants. The Journal of Pediatrics, June 2002; 140(6): 707-712.
8. Soni Arun et al. Clinical profile of seizures in neonatal intensive care unit. In: Fernandez A, Dadhich JP, Saluja S, Editors, Abstracts, XXIII Annual Convention of National Neonatology Forum, Dec. 18-21, 2003; Hyderabad. 2003: 109-111.

9. Rose Arthur MB, Lombroso Cesare T. Neonatal seizures states. A study of clinical, pathological and electroencephalographic features in 137 full-term babies with a long-term follow up. Pediatrics, March 1970;45(3): 404-425.
10. Finer NN et al. Hypoxic ischemic encephalopathy in term neonates: Perinatal factors and outcome. The Journal of Pediatrics, Jan. 1981; 98(1): 112-117.
11. Mizrahi M, Kellaway Peter. Characterization and classification of neonatalseizures. Neurology, 1987; 37: 1837-44.
12. Arvind Sood, Neelam Grover. Biochemical abnormalities in neonatal seizures. Indian Journal of Pediatrics. 2003; 70(3):221-4.
13. Kumar A, Gupta V, Kacchawaha and Singla. A study of biochemical abnormalities in neonatal Seizure. Indian Pediatrics. 1995; 52: 424-427.