www.jmscr.igmpublication.org
Index Copernicus Value: 79.54
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossrefDOI: https://dx.doi.org/10.18535/jmscr/v7i3.33

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

A Study of Neonatal Convulsions with Special Reference to Levels of Magnesium and Incidence of Hypomagnesemia in Hypocalcemic Neonates

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Abstract
Introduction: *Neonatal seizure is a common neurological problem in the neonatal period. Neonatal seizures have always been a topic of interest because of its universal occurrence. A varied number of conditions are capable of causing seizures in the neonatal period the highest incidence of neonatal seizures occurs during first 24hrs of life. Neonatal seizures often signal an underlying ominous neurological condition, most commonly hypoxic ischemia. The other common etiologies of neonatal seizures are intra-ventricular hemorrhage or intra-parenchymal hemorrhage, meningitis, sepsis or metabolic disorders.*
Aims and Objectives
1) To study the etiology of neonatal seizures.
2) To evaluate neonatal seizures with reference to biochemical changes with special reference to serum magnesium levels.
3) Microbiological investigation to find the most common organisms implicated in neonatal seizures
Patients and Methods: *All the babies with neonatal seizures who were admitted in department of Paediatrics between July 2017 and August 2018 were studied*
Results: *The incidence of seizures is most common in during first 24hrs of life. Perinatal Asphyxia is the most common cause of neonatal seizures followed by ICH. Among the Biochemical abnormalities hypoglycemia is the most common cause for neonatal seizures followed by hypocalcemia Of 150 cases meningitis accounts for 18 cases for which most common organism was E.Coli.*

Introduction

Seizure is defined as a paroxysmal, time limited change in motor activity and/or behavior that results from abnormal activity in the brain. Neonatal seizure is a common neurological problem in the neonatal period. Neonatal seizures have always been a topic of interest because of its universal occurrence. A varied number of conditions are capable of causing seizures in the neonatal period the highest incidence of neonatal seizures occurs during first 24hrs of life.

Prompt diagnosis, investigations and treatment are vital as delayed recognition of a treatable cause can have a significant impact on childs subsequent neurological outcome. Neonatal seizures often signal an underlying ominous neurological condition, most commonly hypoxic ischemia. The other common etiologies of neonatal seizures are

intra-ventricular hemorrhage or intra-parenchymal hemorrhage, meningitis, sepsis or metabolic disorders. Seizures cause synaptic reorganisation with aberrant growth (mossy fibres) and may interfere with normal synaptic pruning that takes place during development. If seizures are not controlled, the electrical activity may continue to circulate, a phenomenon called kindling. The presence of seizure does not constitute a diagnosis but is a symptom of an underlying central nervous system disorder due to systemic or biochemical disturbances or infection.

Aims and Objectives

1) To study the etiology of neonatal seizures.
2) To evaluate neonatal seizures with reference to biochemical changes with special reference to serum magnesium levels.
3) Microbiological investigation to find the most common organisms implicated in neonatal seizures

Patients and Methods

This was carried out in the department of Paediatrics, Andhra medical college, King George Hospital, Visakhapatnam, Andhrapradesh.

All the babies with neonatal seizures who were admitted in department of Paediatrics between July 2017 and August 2018 were studied.

Inclusion Criteria: Babies included were both term and preterm babies and babies in first four wks of life with clinical evidence of seizures

Exclusion Criteria: 1)Birth weight <1kg preterm babies were excluded, neonates with congenital anomalies were excluded. 2)Babies who expired during hospital stay prior to adequate workup were excluded from the study.3)Jitteriness

In each baby a detailed history was taken, examination was carried out. Then the following investigations were carried out before subjecting to Neurosonogram.

Blood: Hb%, TC, DC, micro ESR, PCV, Peripheral smear, CRP, Blood Culture and Sensitivity, Random Blood Sugar, Serum Electrolytes– Sodium, Potassium, Calcium, Magnesium

Urine: Albumin, Sugar, Microscopy, Urine culture and Sensitivity

Fundus examination, Lumbar puncture – CSF for colour, cell count, gram stain, sugar and protein, Neurosonogram, CT Brain and MRI Brain.

The criteria for diagnosing various biochemical disturbances and haematological parameters were as follows:

Hypocalcemia – serum Ca <7 mg/dl,
Hypercalcemia – serum Ca >11 mg/dl,
Hypomagnesemia – serum Mg <1.5 mg/dl,
Hypermagnesemia – serum Mg >2.5 mg/dl,
Hyponatremia – serum Na <130 mg/dl,
Hypernatremia – serum Na > 150 mg/dl
Hypokalemia – serum K < 3.5 mg/dl,
Hyperkalemia – serum K >5.5 mg/dl,
Hypoglycaemia – glucose <40 mg/dl,
Polycythemia – PCV >65%

Criteria

Classification of Etiology:

1) Hypoxic ischemic encephalopathy
2) Evidence of fetal hypoxia / distress
3) APGAR score of 3 or less at 5min or later
4) Cord arterial blood pH 7.0
5) Intracranial hemorrhage. Clinical evidence of bulging anterior fontanella, enlarging head circumference, hypotonia, falling PCV with or without CSF showing xanthochromia and or CT scan or U/S detected bleed
6) Hypocalcemia: total serum calcium < 7mg/dl
7) Hypoglycaemia: blood glucose value of <40mg/dl
8) Hyponatremia: serum sodium levels below 130meq/l
9) Meningitis: CSF cell count, protein, sugar, gram stain or culture of CSF showing organisms
10) Idiopathic: where no cause, direct or indirect could be determined

Observation and Results

Present study was conducted in the department of peadiatrics NICU, King George Hospital from July 2017 to August 2018.

A total of 150 neonates with neonatal seizures who fulfilled the inclusion criteria included in the study.

Gender: of the 150 neonates studied 91 were male, 59 were female.

Age at Onset of Seizures

Table 1

Age at onset of seizure	% Distribution
≤24 hrs	51.33%
48-72 hrs	20.67%
72hrs – 1 Wk	14%
> 1Wk	14%

Etiology: The various etiologies of neonatal seizures and their frequency distribution are shown in table 2.

Table 2

Cause	Number of Cases	% Distribution
HIE	79	52.67
ICH	20	13.33
Meningitis	18	12
Hypoglycemia	17	11.33
Hypocalcemia	12	8
Hypomagnesemia	5	3.33
Others	9	6

Perinatal Asphyxia is the most common cause of neonatal seizures followed by ICH.

Biochemical Abnormalities

Table 3

Cause	Number of Cases	% Distribution
Hypoglycemia	20	13.33
Hypocalcemia	12	8
Hypomagnesemia	5	3.33

Among the biochemical abnormalities hypoglycemia is the most common cause for neonatal seizures followed by hypocalcemia.

Hypomagnesemia was the cause in 5 cases out of which 4 cases are associated with hypocalcemia.

Isolated hypomagnesemia is very rare.

ICH was most common in preterm infants.

Organisms

Table 4

Table	% Distribution
E.Coli	44.45%
Klebsiella	33.33%
Staph.aureus	22.22%

Of 150 cases meningitis accounts for 18 cases for which most common organism was E.Coli.

Discussion

Neonatal seizures typically signal underlying significant neurological disease. Seizures occurring during neonatal period are unique because of close relation to the perinatal events and their incidence being a reflection of quality of perinatal and neonatal care. The recognition of etiology is often helpful with respect to prognosis and management. Biochemical disturbances and meningitis occur frequently in neonatal seizure either as an underlying cause or as an associated abnormality. In their presence it is difficult to control seizures and there is risk of further brain damage.

The present study was conducted on neonates with seizures admitted to Neonatology unit of King George Hospital, Visakhapatnam during the study period from July 2017 to August 2018.

150 neonates had seizures during this study period out of which 91 were males..

The present study shows the incidence of neonatal seizures is high in first 24 hrs.

In the present study 79 cases had HIE constituting 52.67% of the cases. ICH was present in 20 cases which constituted 13.33% of the cases. Meningitis was present in 18 of the cases which constituted 12%. Hypoglycemia was present in 17 of the cases which constituted 11.33%, hypocalcemia in 12 cases which constituted 8% and Hypomagnesemia in 5 cases which constituted 3.33% of the cases.

HIE is the most common cause of neonatal seizures in our study.

Meningitis

Infection of the central nervous system is an important cause of neonatal seizures.

Hypocalcemia and Hypomagnesemia

In the present study hypocalcemia was found in 12 cases which accounts to 8% of total cases and hypomagnesemia occurred in 5 cases which account to 3.33% of cases.

Among 5 cases of hypomagnesaemia, in 4 cases both hypocalcemia and hypomagnesemia were documented. So the incidence of hypomagnesaemia in hypocalcemic neonates was 33.3%.

Isolated hypomagnesaemia occurred in only one case which accounts to 0.67% of total cases. Thus occurrence of isolated hypomagnesemia is very rare.

Conclusions and Summary

1) In the present study 150 babies with neonatal seizures were studied.
2) 51.33% of seizures occurred in the first 24hrs of life
3) Etiology in majority of the cases of neonatal seizures was hypoxic ischemic encephalopathy (52.67%) followed in frequency by intracranial hemorrhage (13.33%), meningitis (12%), hypoglycaemia (11.33%), hypocalcemia (8%), Hypomagnesaemia (3.33%) and others(6%).
4) Biochemical changes accounted for 22.66% of the neonatal seizures.
5) Most common biochemical abnormalities noted were hypoglycemia, hypocalcemia.
6) Meningitis accounted for 12% of neonatal seizures.
7) The most common organism implicated in neonatal seizures was Escherichia coli (44.45%), followed by Klebsiella (33.33%), Staphylococcus aureus (22.22%).
8) Biochemical abnormalities are common in neonatal seizures. Biochemical abnormalities which could account for seizures were seen in 22.66% of the cases. Hypoglycemia, hypocalcemia and hypomagnesaemia are the most common biochemical abnormalities. These abnormalities may significantly contribute to seizure activity and possibly correction of these abnormalities may play a significant role in seizure control. A biochemical workup is necessary for all cases of neonatal seizures.
9) Gram negative organisms accounted for most of the cases of neonatal seizures with meningitis.
10) Meningitis was seen in 12% of the cases and most common organism isolated from cerebro spinal fluid was E.coli. Appropriate treatment with antibiotics is essential. Examination of cerebrospinal fluid is essential workup in cases of neonatal seizures.
11) 80% of the cases with normal neurosonogram were found to be normal on follow up
12) Cases with perinatal asphyxia and intraventricular hemorrhage had poor outcome.
13) Neurosonogram had good potential in predicting neurological outcome in neonates with perinatal asphyxia. Neurosonogram should be incorporated in the routine evaluation of seizures.
14) Abnormal neuroimaging and EEG were good predictors for the outcome and developmental delay.
15) In the present study hypomagnesaemia was associated with hypocalcemia in 33% of cases.
16) Isolated hypomagnesaemia as a cause of neonatal seizures is rare.

References

1. Saliba RM, Annegers JF, Waller DK, Tyson JE, Mirzahi EM, 1999, incidence of neonatal seizures in harris county, Texas, 1992-1994. American journal of epidemiology 150: 763-769.
2. Sheth RD, Hobbs GR, Mullett M 1999, neonatal seizures: incidence , onset and

etiology by gestational age, journal of perinatology 19: 40-43
3. Weiner SP, Painter NJ, Geva D, Guthrie RD, Scher MS 1991, neonatal seizures: electroclinical dissociation. Paediatric neurology7: 363-368.
4. Meharban Singh, Care of the Newborn 2015; 8;123-130
5. AIIMS Protocols seizures in newborn, 2008; 149-159
6. Volpe JJ Neonatal seizures in neurology of newborn, Philadelphia, WB. Saunders 1999: 172-225
7. Siegel MJ, Shackelford GD, Perlman JM, Fulling KH, Hypoxic Ischemic Encephalopathy in term infants, Diagnosis prognosis evaluated by ultrasound. Radiology 1984; 394-400
8. Babecock DS, Ball W, Post asphyxia encephalopathy in fullterm infants US diagnosis Radiology 1993: 417-423
9. Wical BS, Neonatal seizures Electrographic analysis, evaluation of outcome, pediatric, newyork, 1994: 10: 271-275
10. M.Mizrahi annals of neurology Neonatal seizures, problems in diagnosis and classification, 42: 318-325
11. Mizrahi eli M, Neonatal seizures and neonatal epileptic syndromes, neurologic clinics in epilepsy 2001; 19(2): 427-456.
12. Meharban singh, care of the newborn, Neurological disorders, 2015; 8: 435-441.
13. Fenichel, Clinical pediatric neurology, signs and symptoms, approach…
14. Janet Rennie; Rennie & Roberton's Textbook of Neonatology, 2012; 5
15. Mary L. Zupana, MD, Neonatal seizures; Pediatric clinics 2004; 51: 961-978
16. Christine A. Gleason, MD, Sherin Devaskar, MD; Avery's Diseases of the Newborn, 2012, 9: 901-919
17. MC Cabe BK, Silveira DC, Cilio M R et al 2001 Reduced neurogenesis after neonatal seizures, Journal of neuroscience 6: 2094-2103
18. .Kleigman, Stanton, St. Geme, Schor, Berhman, Nelson textbook of paediatrics, 20 th edition;volume 3: 2849-2854.
19. Digra K.S, Gupta A. Prevalence of seizures in hospital neonates: JK Science 2007; 9(1): 2729.
20. Holden KR, Mellites ED, Freeman JM, Neonatal seizures, correlation of prenatal and perinatal events with outcome. Paediatrics 1982; 70: 165-176.
21. Airede I.K. Neonatal seizures and a 2 year neurological outcome, J Trop Pediatr 1991; 37: 313-317
22. Cloherty, John P, Eichenwald, Eric C, Stark, Ann R Stark manual of neonatal care, 6: 729-742
23. .Neonatal seizures Volpe JJ eds., Neurology of the newborn 4th edition, Philadelphia: W.B. Saunders, 2001: 178-216.
24. Curtis PD Matthews TG Clarke T et al 1988 neonatal seizures Archives of the diseases in childhood 63: 1065-1067. Ronnen GM, Penny S Andrews W 1999 The epidemiology of clinical neonatal seizures in Newfoundland; a population based study, Journal of paediatrics 134: 71-75.
25. Goldberg HJ. Neonatal convulsions – a 10 year review. Arch Dis child 1983;976-978
26. Alistair GS, Allan C.W, Intraventricular hemorrhage in preterm infants: declining incidence in the 1980's paediatrics 1989; 84(5): 797-801
27. Arvind Sood Neelam Grover and Roshan Sharma. Biochemical abnormalities in neonatal seizures Indian Journal of Pediatrics 2003; 70: 221-224
28. Bergman I, Painter MJ, Hirsch RP, Crumin PK, David R 1983. Outcome in neonates with convulsions treated in ICU. Annals of neurology 14; 642-667
29. Ortibus EL, Sum JM, Hahn JS 1996. Predictive value of EEG for outcome and epilepsy following neonatal seizures.

Electroencephalography and clinical neurophysiology 98; 175-185
30. Bernes SM, Kaplan AM, Evaluation of Neonatal seizures, PCNA 1994; 41: 1069-1102
31. Goldberg HJ 1982 Neonatal convulsions- a ten year review , archives of diseases in children 57: 633-635
32. Ronnen GM, Penny S 1995, the epidemiology of clinical neonatal seizures in Newfoundland, Canada: a 5year cohort, Annals of neurology 38; 518-519
33. Andre M, Matisse M, Vert P, DFebruille C 1998, Neonatal seizures- recent aspects, neuropediatrics 19:202-207.