International Journal of Contemporary Pediatrics
Agrawal V et al. Int J Contemp Pediatr. 2020 Feb;7(2):316-320
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20200101

Original Research Article

Clinico-aetiological profile and outcome patterns of neonatal seizures at a tertiary care centre

Vijay Agrawal*, Dhan Raj Bagri, J. N. Sharma, Roop Singh

Department of Pediatrics, Sir Padampat Mother and Child Health Institute, J. K. Lon Hospital, SMS Medical College, SMS Medical College, Jaipur, Rajasthan, India

Received: 31 December 2018
Revised: 12 October 2019
Accepted: 31 October 2019

***Correspondence:**
Dr. Vijay Agrawal,
E-mail: vijayagrawal30111974@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Neonatal seizures are a major risk factor for neonatal mortality and subsequent neurological disability. The incidence of seizure varies from 1.5-3.7/1000 live birth; while in NICU it can be up to 5/1000 live birth.
Methods: This Descriptive type of observational study aimed to study clinical profile, aetiology in neonatal seizures and short term outcome was done in all Neonatal units attached to paediatric Department of SMS Medical College, Jaipur.
Results: In the 100 cases Majority of neonates had onset of seizure <3 days (<72 hours) 53% and remaining 47% neonates had onset of seizure >3 days (>72 hours). Most common type of neonatal seizure was subtle(75%), other types were tonic seizure (17.3%), clonic seizure (5.1%) and least common type was myoclonic (2.5%). Most common cause of neonates seizure noted was birth asphyxia (73%) second common cause is pyomeningitis and third common cause is hypoglycaemia. Most common cause of neonatal seizure both in full term (71.17%) and preterm (25%) is birth asphyxia. Second most common cause of neonatal seizure in full term is pyomeningitis (8.70%) and in preterm is pyomeningitis and hypoglycaemia (25%). Most common cause of neonatal seizure both in onset of seizure <3 days (<72 hours) 53% and in onset of seizure >3 days (>72 hours).
Conclusions: Out of total 100 cases, neonates with normal birth weight 92% and low birth weight 8%. Majority of neonates had onset of seizure <3 days (<72 hours) 53% and remaining 47% neonates had onset of seizure >3 days (>72 hours). Majority of neonates with seizure delivered by vaginal route (86%) and remaining 14% neonates were delivered by LSCS.

Keywords: Birth asphyxia, Hypoxic ischemic encephalopathy, Neonate, Seizures

INTRODUCTION

Neonatal seizures have been shown to be a major risk factor for in-patients mortality and subsequent neurological disability. The incidence of seizure varies from 1.5-3.7/1000 live birth, while in NICU it can be up to 5/1000 live birth.[1,2] The outcome of neonates with neonatal seizures has changed in recent years due to improved prenatal care, better obstetrical care and intensive neonatal care.[3] However, neonatal seizures remain an important predictor of future neurological complications.[4] Although mortality rates have been reduced, there remains a high morbidity rate, with epilepsy a frequent complication of neonatal seizures.[5] The mortality rate can go up to 27% and commonly occurring in neonates with hypoxic ischemic encephalopathy.[6,7] In addition it may be associated with other permanent neurological disorders such as mental retardation and cerebral palsy.[8] The objective of this study was to describe the neurological outcome of newborns with seizures prospectively followed in the SMS hospital, Jaipur, India.

METHODS

This Descriptive type of observational study aimed to study clinical profile, aetiology in neonatal seizures and short term outcome (in form of mortality) Was conducted in All Neonatal units attached to paediatric Department of SMS Medical College, Jaipur , Rajasthan; after getting requisite ethical clearance from research review board of the institute. In born and out born babies admitted with seizures in neonatal units attached with SMS Medical College aged up to 28 days were included in the study. Neonates with age >28 days and Neonates admitted in paediatric surgical units were excluded. Sample size is calculated at 95 confidence level assuming perinatal asphyxia as aetiology in 57.80% cases of neonatal seizure as per results of reference study.

At the precision (absolute allowable error) of 10%, minimum 97 neonates with seizures are included as sample size which will further rounded off to 100 cases in the present study. Patients selected after applying inclusion and exclusion criteria were subjected to history, clinical examination and laboratory evaluation. The data was collected in a pretested proforma, collected data was analysed statistically.

RESULTS

Out of 100 cases males were 70(70.00%) and Female were 30(30.00%). Maximum number of cases were of Normal birth weight 92(92%) and number of cases having low birth weight 8(8%). Majority of cases of neonatal seizures had onset of seizure <3 days (<72 hrs) 53 (53%) and number of cases having onset of seizures >3 days (72hrs) is 47(47%). Majority of cases of neonatal seizures are delivered by Normal 86 (86%) and rest are delivered by caesarean 14(14%).

Etiological distribution of cases (N=100)

Most common cause of neonatal seizure is birth asphyxia 73(73%) followed by pyomeningitis 10(10%), hypoglycemia 9(9), Hypocalcaemia 3(3%), ICH 2(2%) and BA with HIE II metabolic, NNS, Septicaemia 1(1%) (Figure 1).

Etiological distribution of cases according to maturity, full term cases (>37 weeks)

Most common cause of neonatal seizures in full term neonates in birth asphyxia 71(77.17%), followed by Pyomeningitis 8(8.70%), Hypoglycemia 7(7.61%), Hypocalcaemia 3(3%), ICH 2(2.17%), BA with HIE II metabolic 1(1.09%) (Figure 1).

Etiological distribution of cases according to maturity, preterm cases (<37 weeks)

Most common cause of neonatal seizures in premature newborn in birth asphyxia 2(25%), followed by hypoglycemia 2(25.0%), Pyomeningitis 2(25%), NNS 1(12.5%), Septicemia 1(12.5%) (Figure 2).

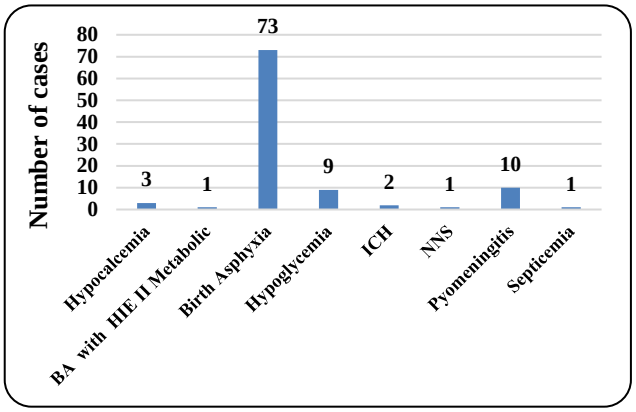

Figure 1: Etiological distribution of cases according to maturity, full term cases.

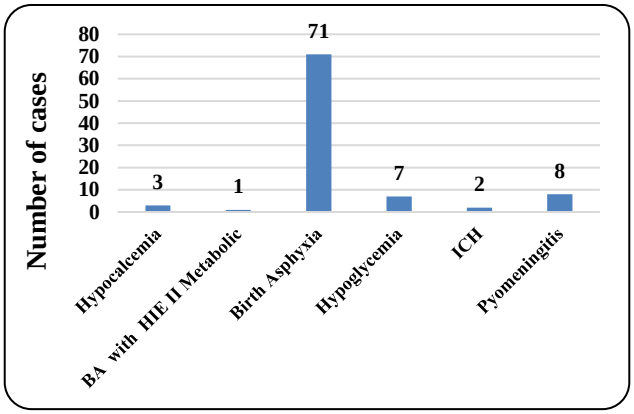

Figure 2: Etiological distribution of cases according to maturity, preterm cases.

Etiological distribution of cases, age of onset of seizure <3 days (<72 hrs)

Most common cause of neonatal seizure in case of onset of seizure <3 days (<72 hrs) in birth asphyxia 51(96.22%), followed by Hypocalcaemia 1(1.89%) and Hypoglycemia 1(1.89%) (Figure 3).

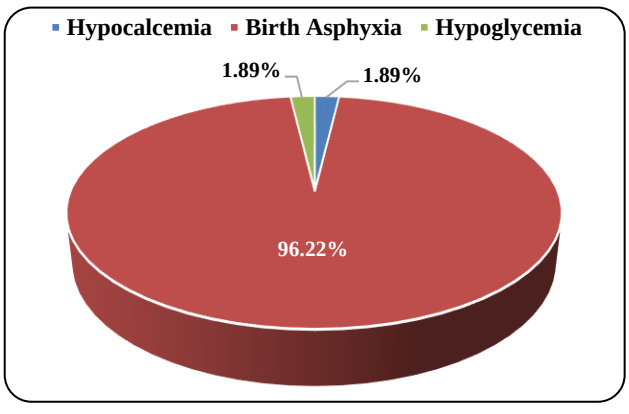

Figure 3: Etiological distribution of cases.

Etiological distribution of cases, age of onset of seizure >3 days (>72 hrs)

Most common cause of neonatal seizure in case of onset of seizure >3 days (>72 hrs) is birth asphyxia 22(46.80%) followed by pyomeningitis 10(21.27%), Hypoglycemia 8(17.02%), Hypocalcaemia 2(4.26%), ICH 2(4.26%), NNS 1(2.13), Septicaemia 1(2.13%) and BA with HIE II metabolic 1(2.12%) (Figure 4).

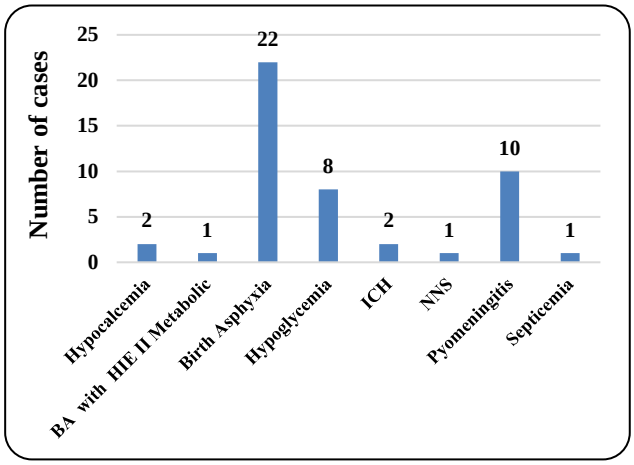

Figure 4: Etiological distribution of cases, age of onset of seizure >3 days.

DISCUSSION

Sex distribution

In this study, male patients were 30(30%) and female were 70(70%). Other workers also reported male preponderance. In study conducted by Sahana G et al, (2014), Sabzehei MK et al, Parvin et al, Moayedi AR et al, were found slightly more male predominance.[9-12] However according to Lanska and Lanska male sex is not associated with risk of neonatal seizures.[13] The reason for male preponderance is not known in above studies but in present study this is attributed to the fact that male infants are better cared for and treatment for any sickness is sought promptly. Secondly, these hospitals based figures could be fallacious as compared to actual sex preponderance of neonatal seizures in the community.

Distribution of cases according to birth weight

In present study 8% were of weight 2499-1500 gm (LBW) and remaining 92% above 2499 gm (normal birth weight, overweight). According to Lanska clinical seizures occur frequently in low birth weight babies.[13] According to Ronen and Penny clinical seizures occur 6 times more often in premature infants than in term infants. In present study the ratio of clinical seizures in neonates of low birth weight and normal weight babies is not as high as in Ronnen and Penny study.[14] This is due to fact that birth weight was not known in majority of cases and weight was taken at time of admission. Present study is comparable to Lanska study as neonatal seizures cases more in low birth weight group.

Distribution of cases according to day of onset of seizure

In this study majority of neonates had seizures onset <3days [72 hrs] i.e.53% and remaining minority of neonates had seizures onset >3days [>72 hrs] i.e. 47%. Similar finding was found by the Sahana G et al and Rohna Gabriel et al.[15] According to Joseph J. Volpe hypoxic-ischemic encephalopathy, usually secondary to perinatal asphyxia, is single most common cause of neonatal seizure in both full term and premature infants, seizure spells characteristically occur in the first 24 hours.[16] According to Lanska study 82.8% occur within first week, 91.4% within first 2 weeks and 96.6% within 3 weeks.[13] Present study is comparable to Ajay Kumar et. al, Joseph J. Volpe and Lanska study as majority of neonatal seizure cases have early onset of seizure.[16]

Distribution of cases according to mode of delivery

This study revealed that majority of cases delivered by vaginal delivery (forceps delivery, vacuum delivery, breech delivery, normal vaginal delivery) 86% and remaining cases are delivered by caesarean section (14%). This higher percentage of vaginal deliveries is because of higher percentage of birth asphyxia (86.1%) as a cause of neonatal seizure, birth asphyxia cases are delivered by vaginal route in majority. This was found similar with the study done by Das and Kumar.[17]

Distribution of cases according to type of seizure

In present study most common type of neonatal seizure is subtle seizure (75.1%) and other types are tonic seizure (17.3%), clonic seizure (5.1%), myoclonic seizure (2.5%). According to John H. Menkes and Harvey B. Sarnat subtle seizure were the most common and account for 71 % of seizures seen in term infant, and 68% of seizures seen in preterm infants.[18] According to Joseph J. Volpe in one study of infants more than 36 weeks of gestation subtle seizure comprises of 85% and in another study subtle seizure account for 70% to 75% of all clinical seizure.[16] Above studies shows that range of subtle seizure cases varies 68-85%. In present study number of subtle seizure cases 75.1% which is comparable to Menke and Sarnet study and Joseph J. Volpe.[16]

Etiological distribution of cases

The present study included 100 cases, most common cause of neonatal seizure is birth asphyxia 73(73%) followed by pyomeningitis 10(10%), hypoglycaemia 9(9), Hypocalcaemia 3(3%), ICH 2(2%) and metabolic causes, Septicemia etc. 1(1%). In present study the largest group of patients was of birth asphyxia (73%), this is attributed to the fact that intrauterine asphyxia,

postnatal respiratory insufficiency, severe right to left shunt, secondary to cardiac disease or persistent foetal circulation, postnatal cardiovascular collapse secondary to ischaemia lead to hypoxaemia (decreased amount of oxygen in cerebral blood supply) which are common denominator in patient with birth asphyxia.

In present study birth asphyxia is most common (73%) cause of neonatal seizure and comparable to Ronen and Penny (40%), Volpe JJ (50-60%). In present study hypoglycaemia is cause of neonatal seizure in 9% cases and comparable to Menkes JH' (5%), Tekgul H, Gauvreau K et al, (2%) but values vane.[14,16,18]

Incidence of birth asphyxia in the study Ajay Kumar et al, (44.44%), Menkes JH3 (46%), Ment and Richard (60%) is also comparable with present study.[19,20] Pyomeningitis in 10% cases in present study and comparable to Tekgul H, Gaurveau and other et al, (1%), Bergman et al, (30%), Tekgul H, Gauvreau K and others 40%), Thomas and Schubert (32%), Levene and Trounce (53%).[21,22] In these studies also birth asphyxia is most common cause of neonatal seizures but values vane. In present study hypocalcaemia is cause of neonatal seizure in 3% cases and comparable to Ajay Kumar et al, (10%), Ajay Kumar et al, (7.77%), Bergman et al, (7%) but values vane. intracranial haemorrhage is found in 2% cases and comparable to Ajay Kumar et al, (4.44%), Ronen and Penny et. al. (7%) but values vane.[19,21] The higher number of birth asphyxia (73%) in present study can be attributed to the quality of antenatal, perinatal and postnatal care available.

Etiological distribution of cases according to maturity

In present study causes of neonatal seizures in full-term neonate were birth asphyxia 71(77.17%), hypoglycaemia 7(7.61%), hypocalcaemia 32(3.26%), pyomeningitis 8(8.70%), intracranial haemorrhage 2(2.17%). Causes of neonatal seizure in preterm neonates were birth asphyxia 2(25%), hypoglycaemia 2(25%), pyomeningitis 2(25%), other I (0.59%). According to Volpe JJ(2008) hypoxic-ischaemic encephalopathy, usually secondary to perinatal asphyxia, is the single most common cause of neonatal seizures in both full-term and preterm infants. According to Bradley WG, Daroff RB, Fenichel GM and Jankovic J most common cause of neonatal seizure in both full term and preterm is hypoxic-ischaemic encephalopathy.[23] Present study is comparable to Volpe JJ, Bradley WG, Daroff RB, Fenichel GM and Jankovic J but values vane.[16,23]

Etiological distribution according to day of onset of seizures

In present study, out of 100 cases of neonatal seizures, 53% (53) had onset of seizures <3 days [<72 hrs]. Out of 53 cases, majority of cases 51(96.22%) were due to birth asphyxia followed by hypoglycaemia 1(1.89%), hypocalcaemia 1(1.89%). According to Volpe JJ (2008) perinatal asphyxia (birth asphyxia) is most common cause of neonatal seizure and in perinatal asphyxia seizures characteristically occur in first 24 hours. This is consistent with Rose and Lombros study where birth asphyxia is the most common cause of neonatal seizure on first day of life. Intracranial injury seizure type occurs most often on 2nd day of life and not later than 7 days. According to Eriksson and Zetterstrom (1979) most common cause of early onset neonatal seizures is birth asphyxia.

In present study, out of 100 cases of neonatal seizures, 47(47%) had onset of seizures >3 days [>72 hrs]. Out of 47 cases, birth asphyxia 22(46.80%), hypoglycaemia 8(17.02%), hypocalcaemia 2(4.25%), pyomeningitis 10(21.27%), intracranial haemorrhage 2(4.26%). According to Ronen and Penny study (1999) the most common cause of neonatal seizures from 4-7 day of life is metabolic.[14]

CONCLUSION

In the 100 cases males were 70% and female were 30%. Male: Female ratio was 2.33:1. In present study most of neonates were Hindus. Out of total 100 cases, majority belong to rural. Out of total 100 cases, neonates with normal birth weight 92% and low birth weight 8%. Majority of neonates had onset of seizure <3 days (<72 hours) 53% and remaining 47% neonates had onset of seizure >3 days (>72 hours).

Majority of neonates with seizure delivered by vaginal route (breech delivery) ventous delivery, forceps delivery, normal vaginal delivery) 86% and remaining 14% neonates delivered by LSCS. Most common type of neonatal seizure was subtle 75%, other types were tonic seizure 17.3%, clonic seizure 5.1% and least common type was myoclonic 2.5%.

Most common cause of neonates seizure is birth asphyxia 73% second common cause is pyomeningitis, third common cause is hypoglycaemia. Most common cause of neonatal seizure both in full term 71.17% and preterm 25% is birth asphyxia. Second most common cause of neonatal seizure in full term is pyomeningitis 8.70% and in preterm is pyomeningitis and hypoglycaemia 25%. Most common cause of neonatal seizure both in onset of seizure <3 days (<72 hours) 53% and in onset of seizure >3 days (>72 hours).

Recommendations

Authors have recommended to give more emphasis on hospital deliveries by trained personnel with protocol management with strict asepsis and follow up of neonates with appropriate interventions and counselling of parents with written documentation.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Talebian A, Jahangiri M, Rabjee M, Alavi NM, Akbari H, Sadat Z. The etiology and clinical evaluations of neonatal seizures in Kashan, Iran. Iran J Child Neurol. 2015;9(2):29-35.
2. Sadeghian A, Damghanian M, Shariati M. Neonatal Seizures in a Rural Iranian District Hospital: Etiologies, Incidence and Predicting Factors. Acta Medica Iranica, 2012;50(11):760-4.
3. Arpino C, Domizio S, Carrieri MP, Brescianini S, Sabatino G, Curatolo P. Prenatal and perinatal determinants of neonatal seizures occurring in the first week of life. J Child Neurol. 2001;16(9):651-6.
4. Dennis J. Neonatal convulsions: aetiology, late neonatal status and long-term outcome. Develop Med Child Neurol. 1978;20(2):143-58.
5. Keen JH, Lee D. Sequelae of neonatal convulsions. Study of 112 infants. Arch Dis Childhood. 1973;48(7):542.
6. Kuti BP, Oseni SB, Owa JA. Pattern, etiological factors and determinants of mortality among sick newborns with seizures in Ilesa, Nigeria. J Pediatr Neuroscie. 2015;10(3):227.
7. Ghanshyambhai P, Sharma D, Patel A, Shastri S. To study the incidence, etiology and EEG profile of neonatal seizures: a prospective observational study from India. J Maternal-Fetal Neonatal Med. 2016;29(4):554-8.
8. Clancy RR, Legido A. Postnatal epilepsy after EEG-confirmed neonatal seizures. Epilepsia. 1991;32(1):69-76.
9. Sahana G, Anjaiah B. Clinical profile of neonatal seizures. Intern J Med Applied Sci. 2014;3(1).
10. Sabzehei MK, Basiri B, Bazmamoun H. The etiology, clinical type and short outcome of seizure in Newborns hospitalized in Basat hospital, Hamadan, Iran. Iran J Child Neurol. 2014;8(2):24-8.
11. Parvin R, Salim AF, Rahman M, Chowdhury K, Sultana A, Ahmed S, et al. Neonatal Seizures: Correlation between Clinico-Etiological Profile and EEG Findings. Bangl J Child Health. 2014;38(1):19-23.
12. Moayedi AR, Zakeri S, Moayedi F. Neonatal seizure: etiology and type. Iran J Child Neurol. 2014;2(2):23-6.
13. Lanska MJ, Lanska DJ, Baumann RJ, Kryscio RJ. A population-based study of neonatal seizures in Fayette County, Kentucky. Neurol. 1995;45(4):724-32.
14. Ronen GM, Penney S, Buckley D, Streiner DL. Long-term prognosis in children with neonatal seizures: a population-based study. Neurol. 2007;69:1816-22.
15. Ronen GM, Rosales TO, Connolly M, Anderson VE, Leppert M. Seizure characteristics in chromosome 20 benign familial neonatal convulsions. Neurol. 1993;43(7):1355.
16. Volpe JJ. Neonatal Seizures, Neurology of the newborn, 5th ed. Philadelphia: Saunders Elsevier; 2008:203-244.
17. Das D, Debbarma SK. A Study on Clinico-Biochemical Profile of Neonatal Seizure. J Neurol Res. 2016;6(5-6):95-101.
18. Menkes JH, Sarnat HB. Child Neurology, 7th ed. Philadelphia: Lippincot William & Wilkins; 2005:991-995.
19. Kumar A, Gupta A, Talukdar B. Clinico-Etiological and EEG Profile of Neonatal Seizures. Ind J Pediatr. 2007;74(l):33-7.
20. Bridgers SL, Ebersole JS, Ment LR, Ehrenkranz RA, Silva CG. Cassette electroencephalography in the evaluation of neonatal seizures. Archives Neurol. 1986;43(1):49-51.
21. Kliegman RM, Behrman RE, Jenson HB, Stanton BF. Neelson Text Book of Pediatrics, 18th ed.; 2007:2471-2473.
22. Tekgul H, Gauvreau K, Soul J, Murphy L, Robertson R, Stewart J, et al. The current etiologic profile and neurodevelopmental outcome of seizures in term newborn infants. Pediatrics. 2006 Apr 1;117(4):1270-80.
23. Bradley WG, Daroff RB, Fenichel GM, Jankovic J. Neurology in Clinical Practice. 4th ed. Butterworth Heinemann: Elsevier; 2003:2512-2514.

Cite this article as: Agrawal V, Bagri DR, Sharma J.N., Singh R. Clinico-aetiological profile and Outcome patterns of neonatal seizures at a tertiary care centre. Int J Contemp Pediatr 2020;7:316-20.