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Original Research Article

A Study of Clinical and Biochemical Profile of Neonatal Seizures

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Abstract

Background: One of the most prevalent and recognizable clinical signs of a neurological system in failure is neonatal seizures. Neonatal seizures are the outcome of the developing nervous system's reactions to various shocks and can cause significant neonatal death and morbidity as well as childhood physical and cognitive deficits. Preterm infants are more likely to experience newborn seizures than term infants, and metabolic disorders are a frequent cause of neonatal seizures.

Methods: Based on the inclusion and exclusion criteria a total of n=50 cases were enrolled for the current study. A detailed record of names, ages, sexes, addresses, weights, lengths, head circumferences, and gestational ages are reported, along with their detailed prenatal histories and baseline features. A thorough physical examination was performed, and clinical observation was used to identify seizures were recorded. Each seizure episode's clinical information, such as age at seizure onset, seizure duration, number, and type, was documented. According to Volpe's criteria, seizures were divided into five categories: mild, focal clonic, multifocal clonic, tonic, and myoclonic.

Results: Out of a total of n=50 neonates hypoglycemia was found in n=12(24%) of cases. Out of the n=14 preterm babies n=5/14, preterm neonates (35.71%) were with hypoglycemia. In the case of term babies out of n=36 cases n=7/36 (19.44%) were with hypoglycemia although the occurrence of hypoglycemia was higher in preterm neonates the p-values were (>0.05) hence not significant. A total of n=10 cases were detected with hypocalcemia. Based on the term distribution of the cases out of preterm babies n=3/14 (21.42%) were with hypocalcemia and in term babies, hypocalcemia was found in n=7/36 (17.44%) cases.

Conclusion: One of the most prevalent neurological conditions in newborns is neonatal seizures. Neonatal seizures can have a variety of origins, which affects not only how the disease develops but also its long-term neurological consequences, mortality, and morbidity. To prevent these issues, early examination, prompt diagnosis, and vigorous care in accordance with the etiology are required. Additionally, biochemical anomalies could either be a secondary issue or could be linked to other etiologies.

Keywords: Neonatal seizures, biochemical abnormalities, hypoglycemia, hypocalcemia

Introduction

One of the most prevalent and recognizable clinical signs of a neurological system in failure is neonatal seizures. Neonatal seizures cause significant neonatal mortality and long-term morbidity, including developmental motor and cognitive deficits. They are non-specific reactions of the developing nervous system to many stressors. [1, 2] Multiple obstacles prevent the doctor from evaluating and managing the newborn with suspected seizures, even if urgent diagnostic and therapeutic interventions are required. These newborn convulsions are frequently misdiagnosed and challenging to manage. The largest database in India, the National Neonatal Perinatal Database, which gathered information from 18 tertiary care facilities across the nation, indicated an incidence of 10.3 per 1000 live births. It was discovered that the incidence rose with decreasing gestation and birth weight; for instance, preterm infants had nearly twice the incidence of term neonates (20.8 vs. 8.4 per 1000 live births), while infants with very low birth weight had an incidence that was more than four times higher (36.1 per 1000 live births**). [3]** In their investigation on clinico-etiological and EEG, Ajay Kumar et al., [4] Neonatal seizures are one of the most common and distinctive clinical manifestations of dysfunction of the neurological system. According to a profile of newborn seizures, the overall incidence is 11.7/1000 live births, with 6.14% of those being preterm infants in comparison to term infants (0.69%) (10) In the research by Yadav et al., [5] which was carried out in Uttar Pradesh, Neonatal convulsion frequency overall was 5.52%, identical to According to a study by Aziz et al., [6] the cumulative frequency is 3.9%. (12) Therefore, it is crucial to identify seizures early and start treatment immediately. Understanding the cause is frequently beneficial for prognosis and treatment. However, in clinical practice at neonatal intensive care units (ICU), in developing countries where synchronized video-EEG monitoring is essentially non-existent, clinical observation becomes the key to the diagnosis. Studies suggest that neonatal seizures and their etiology have a significant impact on the developing brain. [7] Because continuous video-EEG monitoring is not feasible at our facility, we conducted this study to both identify neonatal seizures using clinical criteria and to ascertain the biochemical abnormalities related to these clinical convulsions.

Material and Methods

This cross-sectional study was conducted in the Department of Pediatrics and Neonatology, Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana State. Institutional Ethical committee approval was obtained for the study. Written consent was obtained from the parents of the patients included in the study.

Inclusion criteria

All Term and preterm babies presenting with seizures

Both intramural and extramural neonates

Male and females

Exclusion criteria

Neonates already receiving anticonvulsant therapy

Parents not giving consent for the study

Based on the inclusion and exclusion criteria a total of n=50 cases were enrolled for the current study. A detailed record of names, ages, sexes, addresses, weights, lengths, head circumferences, and gestational ages are reported, along with their detailed prenatal histories and baseline features. A thorough physical examination was performed, and clinical observation was used to identify seizures were recorded. Each seizure episode's

clinical information, such as age at seizure onset, seizure duration, number, and type, was documented. According to Volpe's criteria, [8] seizures were divided into five categories: mild, focal clonic, multifocal clonic, tonic, and myoclonic. Before instituting specific treatment, 3ml of blood will be collected by sterile technique in a sterile test tube for the following investigations like blood glucose levels, total serum calcium levels, serum magnesium levels, serum sodium, and serum Potassium levels were estimated by the Department of Biochemistry.

Statistical analysis: Data was entered into MS Excel sheets, and the analysis is shown below and analyzed by SPSS version 19 in windows format. For quantitative variables, the mean and standard deviation were used in the descriptive analysis. Categorical variables were evaluated by paired t-tests, ANOVA, and independent sample t-tests performed, and p-values of <0.05 were considered significant.

Results

In this study out of n=50 neonates included n= 25(50%) cases were Normal vaginal delivery and n=23(46%) cases were LSCS and n=2(4%) cases were forceps delivery. In the study group, n=41(82%) were intramural deliveries and n=9(18%) were extramural deliveries. The study group included n=28(56%) were males and n=22(44%) were females. In our study, n=36 cases were term deliveries and n=14 cases were preterm deliveries and no case of post-term delivery was found in this study depicted in figure 1.

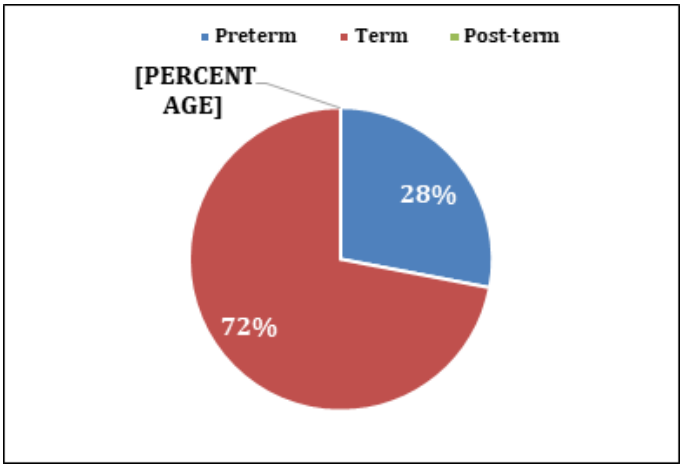

Figure 1: Distribution of cases based on (Term at delivery) in the study population (n=50)

Among the study population, the small for gestation (SGA) n=14(28%) cases, appropriate for gestation (AGA), n=35(70%) cases, and large for gestation (LGA) n=1(2%) cases respectively. The mean birth weight of the study population was 2.45 ± 0.68 Kg with a range from 0.95 Kg to 4.10 Kg. In the study population, babies with Low birth weight (<2.5kg) were n=22(44%) cases and with Normal Birth weight > 2.5 Kgs were 28(56%) of cases.

Table 1: Showing the days of onset of seizures in the population

Day of onset category	*Frequency*	*Percentage*
Within 24 hours	14	28.00
24 to 72 Hours (days 1 to 3)	22	44.00
4th day to 1 week (days 4 to 7)	10	20.00
More than 1 week (More than 7 days)	04	08.00

In our study onset of seizures within 24 hours was n=14 cases, between 24 to 72 Hours (day 1 to 3) was n=22 cases 4th day to 1 week was n=10 cases and more than 1 week was n=4 cases details depicted in table 1.

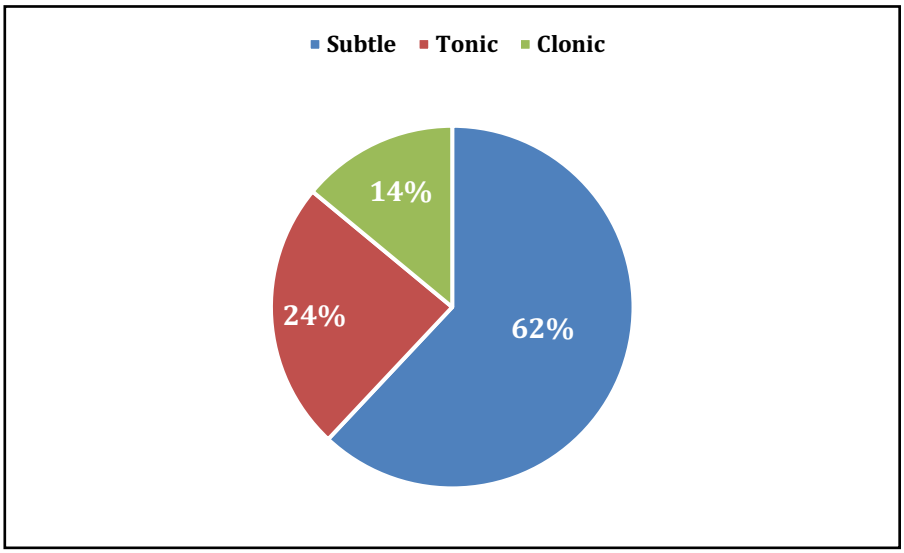

Figure 2: Type of seizures in the case of the study

Out of a total of n=50 neonates, hypoglycemia was found in n=12(24%) of cases. Out of the n=14 preterm babies n=5/14, preterm neonates (35.71%) were with hypoglycemia. In the case of term babies out of n=36 cases n=7/36 (19.44%) were with hypoglycemia although the occurrence of hypoglycemia was higher in preterm neonates the p-values were (>0.05) hence not significant. A total of n=10 cases were detected with hypocalcemia. Based on the term distribution of the cases out of preterm babies n=3/14 (21.42%) were with hypocalcemia and in term babies, hypocalcemia was found in n=7/36 (17.44%) cases. Hyponatremia was detected in n=4 cases (table 2) out of n=4 cases n=1/14(7.14%) cases was in preterm baby and n=3/36 (8.33%) cases were in term babies. Hypomagnesemia, as well as hyponatremia, was found in n=2 cases each out of which in preterm cases n=1/14(7.14%) was with hypomagnesemia and no case of hypernatremia was detected in preterm babies.

Table 2: Biochemical abnormalities in the study population

Biochemical Abnormalities	*Frequency*	*Percentage*
Hypoglycemia	12	24.00
Hypocalcemia	10	20.00
Hyponatremia	4	08.00
Hypomagnesemia	2	04.00
Hypernatremia	2	04.00

Among the n=14 preterm babies, 64.28% cases had subtle seizures and 21.43% cases had Tonic seizures and 14.28% cases had clonic seizures. Similarly, in term babies' subtle seizures were in 58.33% of cases and tonic seizures in 30.56% of cases, and clonic seizures in 11.11% of cases. The p-value was (>0.05) hence non-significant the details are depicted in table 3.

Table 3: Association of type of seizure and term and preterm neonates

Seizure	*Preterm (n=14)*	*Term (n=36)*	*P value*
Subtle	9 (64.28%)	21(58.33%)	0.816
Tonic	3(21.43%)	11(30.56%)	
Clonic	2(14.28%)	4(11.11%)	

Discussion

Seizures are the most common neurological disorders in the newborn which are more prevalent in preterm neonates compared to term neonates. In my study, a total of n=50 neonates with seizures who got admitted into the neonatal intensive care unit of Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana State was included based on the inclusion and exclusion criteria. Out of n=50 cases, 72% of deliveries were term deliveries and 28% were preterm deliveries. In this study small for gestation (SGA) n=14(28%) cases, appropriate for gestation (AGA), n=35(70%) cases and large for gestation (LGA) n=1(2%) cases respectively. According to Aziz et al., [6] term, newborns make up 65% of the population, preterm babies make up 35%, and there are AGA rates of 68%, SGA rates of 26%, and LGA rates of 6%. P Weon et al., [9] and Dinesh et al., [10] in their research, noted that term newborns had a much greater incidence than preterm neonates. In Dinesh et al., [10] study 91.3% of the term, 7.8% of preterm, and 0.9% of post-term infants were having seizures. In the current study n=28(56%) were males and n=22(44%) were females the male to female ratio was 1.27: 1. Tekgul et al., [11] showed male: female ratio to be 1.15:1 whereas Sudia et al., [12] reported 1.73: 1.0 further supporting my study that seizures are common in males. In this study, n=24(48%) cases were born by normal vaginal delivery and n=24(48%) cases by LSCS, and n=2(4%) cases were forceps delivery. A similar study by Aziz et al., [6] found neonates with seizures born by normal delivery to be 48% of those by LSCS in 28% of cases and operated vaginal delivery in 24% of cases. In this study, we found Low birth weight (<2.5kg) were n=22(44%) cases, and Normal Birth weight > 2.5 Kgs were 28(56%) of cases. Dinesh et al., [10] found that neonates >2.5 kg were 65% and <2.5kg were 35% respectively. In our study onset of seizures within 24 hours was 28% of cases, between 24 to 72 Hours (day 1 to 3) was in 44% of cases 4th day to 1 week was in n=10 cases and more than 1 week was in 8% cases. Thus, most of the seizures occurred within the first 3 days of life contributing to about 72% of neonates in this study. Similar observations were made by Dinesh et al., [10] where seizures within 3 days were reported to be 71.3% and Nawab et al., [13] observed 73.6 % of neonatal seizures within 3 days which were comparable with my study. This study found subtle seizures were present in 30% of cases tonic seizures occurred in 28% of cases and clonic seizures in 6% of cases. Similar reports were published by Sudia et al, who found that 10% of newborns experienced multifocal clonic seizures, followed by generalized tonic seizures in 19.33% of cases and subtle seizures in 63.33%. In their research on neonatal seizures, Dinesh et al., [10] found that the most frequent kind, accounting for 42.6% of cases, was subtle seizures. Tonic seizures accounted for 33.9% of cases and clonic seizures for 15.7% of neonates. In several investigations that were analogous to my own, Yadav et al., [5] Park Weon et al., [9] and Nawab et al., [13] indicated that mild seizures were the most frequently seen form. In this study out of n=50 neonates, n=24 neonates had one or more biochemical abnormalities accounting for 48% of the total cases. In their study, Sood et al., [14] which was equivalent to mine, found that overall biochemical

abnormalities were present in 29 instances, or roughly 49.15% of the cases. Similar findings were made by Nawab et al., [13] in their investigations, which included 110 newborns, 46 of whom exhibited biochemical abnormalities, accounting for a total of 41.8% of cases. Contrary to Madhusudan et al., [15] 43.33% finding, Kumar et al., [16] discovered general biochemical abnormalities in 62.8% of newborns. In this study, hypoglycemia and hypocalcemia were the two most often observed biochemical abnormalities, especially in preterm newborns. hypoglycaemia was found in n=12(24%) of cases. Out of the n=14 preterm babies n=5/14, preterm neonates (35.71%) were with hypoglycemia. In the case of term babies out of n=36 cases, n=7/36 (19.44%) were with hypoglycemia. In this study, hypoglycemia and hypocalcemia were the two most often observed biochemical abnormalities, especially in preterm newborns. Similar findings were observed by Suganthi et al., [17] who found that 89 (59.3%) out of 150 cases had metabolic abnormalities. The most prevalent of these was hypoglycemia and hypocalcemia, with 39 (43.8%) and 28 (35.4%) instances, respectively. In their studies, Shah et al., [18] and Prasad et al., [19] similarly discovered hypoglycemia to be the most prevalent metabolic abnormality, followed by hypocalcemia, which supports my findings. The most frequent biochemical abnormalities in their investigation were hypoglycemia and hypocalcemia, according to Yadav et al., [5] and R Malik et al., [20] respectively.

Conclusion

One of the most prevalent neurological conditions in newborns is neonatal seizures. Neonatal seizures can have a variety of origins, which affects not only how the disease develops but also its long-term neurological consequences, mortality, and morbidity. To prevent these issues, early examination, prompt diagnosis, and vigorous care in accordance with the etiology are required. Additionally, biochemical anomalies could either be a secondary issue or could be linked to other etiologies.

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