



ETIOLOGICAL PROFILE OF NEONATAL SEIZURES WITH SPECIAL REFERENCE TO BIOCHEMICAL ABNORMALITIES

Gurdeep Singh Dhanjal¹, Vikramjot Singh², Gurnoor Singh³

¹Professor, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala.

²Junior Resident, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala.

³Junior Resident, Department of Pediatrics, Maharishi Markandeshwar Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala.

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Corresponding Author: Vikramjot Singh

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ABSTRACT:

Introduction: Neonatal seizure is the most frequent manifestation of neurological dysfunction in a neonate. Detection of seizure and its etiology is important for guiding therapy. In the presence of biochemical abnormalities, it is difficult to control seizures and there is a risk of further brain damage. Early recognition and treatment of biochemical abnormalities are essential for optimal management and satisfactory long term outcome. The aim was to determine the etiology of neonatal seizures and to study the biochemical abnormalities.

Material and Methods: The present study included 70 inborn neonates presenting with seizures admitted to the neonatal unit in MMIMSR, Mullana, Ambala, Haryana, India over a period of one and a half years. A detailed history was taken and clinical examination of the neonate was done. Etiological causes and various biochemical parameters were evaluated.

Results: Neonatal seizures occurred more commonly in males. The most common cause of neonatal seizures was birth asphyxia seen in 26 (37.1%) neonates followed by sepsis in 24 (34.3%) neonates. The Primary Biochemical abnormalities were seen in 12 (17.1%) neonates with seizures. Among these neonates, hypoglycemia was most commonly seen in 4 (33.3%) neonates followed by hypocalcemia seen in 3 (25%) neonates.

Conclusion: Biochemical abnormalities are common in neonatal seizures and often go unrecognized. These abnormalities may significantly contribute to seizure activity and hence a biochemical workup is necessary for all cases of neonatal seizures.

Keyword: Neonatal Seizures, Hypocalcemia, Hypoglycemia, Biochemical Abnormality

INTRODUCTION:

Seizures in neonates represent the most distinctive frequent manifestations of neurological disease¹. Seizures are the most common neurological emergency in the neonatal period occurring in 1–5 per 1000 live births². The incidence of seizures varies with birth weight and gestational age and is most common in the very low birth weight (VLBW) neonates. In neonatal seizures, adverse effect on neurodevelopment is on an increasing trend and may affect cognitive, epileptic or behavioural sequelae later in life³.

Neonatal seizures are rarely idiopathic. Common causes of seizures in neonates include birth

asphyxia, intracranial hemorrhages, infections, biochemical abnormalities like hypoglycemia, hypocalcemia, hypomagnesemia, hyponatremia and inborn errors of metabolism. Biochemical abnormalities should be detected and treated at early stages for ideal management and favourable long-term outcome. The aim was to determine the etiology and to study biochemical abnormalities of neonatal seizures.

Materials and Methods:

The prospective study was conducted on 70 inborn neonates with clinical seizures admitted in Neonatology division of Department of Pediatrics,

Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, Ambala over the period of one and half years.

Inclusion Criteria:

- Inborn neonates presenting with first episode of clinical seizures in the Neonatal Intensive Care Unit (NICU) Department of Pediatrics

Exclusion Criteria:

- Neonates with an isolated subtle phenomenon, apnea or paroxysmal autonomic changes
- Any neonate born with obvious central nervous system anomaly
- Neonates who had jitteriness, tetanic spasms, subtle seizures
- neonates whose parents did not gave consent for the study

Detailed antenatal history and perinatal history were recorded. Baseline characteristics of convulsing neonate including sex, gestational age, weight, head circumference and length were recorded at admission. Clinical details of each seizure episode were recorded, i.e., age at onset of seizures, duration of seizure, number and type of seizure. At the time of seizure, after proper management of airway, breathing, circulation as per the standard guidelines, baseline characteristics of all the babies were recorded on the prescribed proforma.

Before instituting specific treatment, random blood sugar, serum calcium, serum sodium, serum potassium, serum magnesium, serum phosphorus, and serum chloride were determined. In addition, complete blood counts, blood culture, CSF analysis, ultrasound cranium were done as per the requirement of the individual cases.

Data was analysed with SPSS version 16 (Statistical Package for Social Sciences).

Results:

A total of 70 neonates with seizures presenting to Neonatal Intensive Care Unit (NICU) of Department of Pediatrics, MMIMSR, Mullana, Ambala, Haryana during the period of one and a half year, were included in the present study. Among these 70 cases, 45 (64.3%) were males and 25 (35.7%) were females. Male dominance was observed in this

study with a male: female ratio of 1.8:1. 41 (58.6%) neonates were born to primigravida mother and 29 (41.4%) were born to multigravida mother. Among 70 neonates, 40 (57.1%) neonates were born by vaginal delivery, 27 (38.6%) neonates were born by Lower segment Caesarean Section (LSCS) and 3 (4.3%) neonates were born by vaginal delivery assisted by forceps. APGAR ≥ 7 at 5 minutes was seen in 44 (62.9%) cases had while 26 (37.1%) cases had APGAR below 7.

Table 1: Incidence of seizures according to weight

Birth Weight	Number	%
≥ 2500 grams	37	52.9
1500 to 2499 grams	25	35.7
1000 to 1499 grams	5	7.1
<1000 grams	3	4.3

Table 2: Etiology of neonatal seizures

Etiology of seizures	No.	%
Birth asphyxia	26	37.1
Sepsis (including meningitis)	24	34.3
Primary Metabolic abnormality	12	17.1
IVH	1	1.4
Unknown	7	10

Table 3: Distribution of Primary Metabolic Abnormalities among the cases (n=12)

Primary Metabolic Abnormalities	No.	%
Hypoglycemia	4	33.3
Hypocalcemia	3	25
Hypomagnesemia	1	8.3
Hypocalcemia with hypoglycemia	2	16.7
Hypocalcemia with hypomagnesemia	1	8.3
Hypocalcemia with Hyponatremia with Hypomagnesemia	1	8.3

Discussion:

Neonatal seizures are a common neurological manifestation in neonates. It is the most common sign of neurological dysfunction in the neonate. Neonatal seizures are an important cause of neonatal morbidity and mortality.

In our study, out of 70 neonates with clinical seizures, male predominance was observed with 45 (64.3%) males and 25 (35.7%) were females with

male to female ratio of 1.8:1. Similar results were observed in a study by Singh A *et al*⁴ in which out of 110 neonates, 65 (59%) were males whereas 45 (41%) were females with male to female ratio of 1.89:1. Mishra *et al*⁵ in their study, noticed male predominance with 233 (63.8%) males out of 365 neonates in total and male to female ratio 1.8:1.

In our study, 37 (52.9%) neonates had birth weight more than 2500 grams. While 25 (35.7%) neonates had low birth weight (LBW), 5 (7.1%) neonates had very low birth weight (VLBW) and 3 (4.3%) neonates were extremely low birth weight (ELBW). In a study by Das *et al*⁶, 65% cases had birth weight > 2500 grams, 25% had birth weight 2000 to 2500 grams and 10% cases weighed 1000 to 2000 grams. In a study by Moayed *et al*⁷, 73.6% neonates had normal birth weight 2500-4000 grams, 22.7% had birth weight <2500 grams and 3.6% had birth weight > 4000 grams. The neonatal seizures were more common in neonates with birth weight more than 2500 grams probably due to more chances of occurrence of birth asphyxia in these neonates.

In our study, 40 (57.1%) neonates with seizures were born by vaginal delivery, 3 (4.3%) neonates were born by vaginal delivery assisted by forceps, 27 (38.6%) neonates were born by Lower segment Caesarean Section (LSCS). Similar incidence was found in a study by Mishra *et al*⁵, Das *et al*⁶ where the incidence of seizures in neonates born by normal vaginal delivery was 60.42% and 90% respectively. Also, in studies by Mishra *et al*⁵, Das *et al*⁶ neonates born by LSCS were 15.12% neonates and 8% neonates respectively. While in the studies of Mishra *et al*⁵ and Das *et al*⁶, 24.46% neonates and 2% neonates respectively required some form of instrumentation.

In our study, birth asphyxia was the most common cause of seizures seen in 26 (37.1%) neonates followed by sepsis including meningitis seen in 24 (34.3%) neonates. In studies done by Das *et al*⁶ and Singh A *et al*⁴, birth asphyxia was the most common cause of neonatal seizures with 56% and 40% neonates respectively. Birth asphyxia is most common in developing countries due to inadequate facilities and irregular follow up leads to inadequate management of perinatal asphyxia in utero. It is also an overall most common cause of

neonatal seizures in both developed as well as developing countries.

The most common biochemical abnormality in our study among cases of primary metabolic seizures was hypoglycemia seen in 4 (33.3%) neonates. Hypoglycemia was seen along with hypocalcemia in 2 (16.7%) neonates. Among the primary metabolic abnormalities, isolated hypoglycemia was seen in studies of Das *et al*⁶, Nawab T *et al*⁸, Madhusudha *et al*⁹ with 9 (69.2%), 9 (69.3%), 12 (52.17%) neonates respectively.

Hypocalcemia was the second most common primary metabolic abnormality observed in 3 (4.3%) neonates with seizures. Hypocalcemia was seen along with hypoglycemia in 2 (2.9%) neonates, with hypomagnesemia in 1 (8.3%) case and along with both hyponatremia and hypomagnesemia in 1 (8.3%) neonates. In studies by Nawab T *et al*⁸ and Madhusudha *et al*⁹, hypocalcemia was observed as primary metabolic abnormality observed in 3 (23.1%) and 5 (21.73%) neonates with seizures.

Hypocalcemia and hypoglycemia are the most common biochemical abnormalities seen in neonatal seizures. The exact contribution of hypocalcemia and hypoglycemia in the onset of neonatal seizures in patients of birth asphyxia is not certain¹⁰. They have a good long term outcome if treated promptly.

In our study, isolated hypomagnesemia was seen in one (8.3%) neonate while it was seen along with hypocalcemia in one (8.3%) neonate and along with both hypocalcemia and hyponatremia in one (8.3%) neonate. Hypomagnesemia may be caused by transient functional hypoparathyroidism, magnesium deficiency in mother, impaired absorption and target unresponsiveness¹¹. In a study by Madhusudha *et al*⁹, 1 (4.3%) cases of neonatal seizures had hypomagnesemia. In a study by Das *et al*⁶, hypomagnesemia was observed in 2 (15.4%) cases and in association with hypocalcemia in one (7.6%) case.

Among the cases of primary metabolic abnormality, hyponatremia was seen in association with hypocalcemia and hypomagnesemia in one (8.3%) case. Hyponatremia probably occurred due to fluid overload occurring as a result of renal

injury or due to syndrome of inappropriate secretion of anti-diuretic hormone caused by perinatal asphyxia¹².

Conclusion:

The recognition of the cause of neonatal seizures is often helpful with respect to prognosis and treatment. The most common etiology for neonatal seizures is birth asphyxia which can be prevented if proper antenatal and postnatal care is taken. Biochemical abnormalities are common in neonatal seizures and occur either as an underlying cause or an associated abnormality. Biochemical workup is necessary for all cases of neonatal seizures. In the presence of these abnormalities, it is difficult to control seizures and may result in further brain damage. Early recognition and treatment of biochemical disturbances are essential for optimal management and satisfactory long term outcome.

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