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Original Research Article

Clinical & etiological profile of new onset unprovoked seizure in children aged 2 months to 18 years

Ravikant Sankhala[1], **Bhupesh Jain**[1,*]

[1]*RNT Medical College, Udaipur, Rajasthan, India*

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ABSTRACT

Background: Seizure is defined as abnormal paroxysmal neuronal discharge, which is clinically manifested by motor, sensory, autonomic or behavioral disturbances. Seizures are common in pediatrics age group and occur in 10% of children. Less than 1/3rd of seizures in children are caused by epilepsy. The objective of the study was to determine the clinical and etiological profile of new onset unprovoked seizure in children aged between 2 month to 18 years.

Materials and Methods: A hospital based prospective single centre study at RNT Medical College, Udaipur. 111 patients admitted in Balchikitsalya with new onset unprovoked seizures during one year.

Results: Out of 111 patients with new onset unprovoked seizures, majority of patients were between 1-5 years of age with male predominance. In which most common diagnosis was seizure disorder in 78 pts (70.2%) [Generalised 76 pts (97.4%) > Focal 2 pts (2.6%)] followed by 13.5% hypocalcemic seizure, 8.1% hypoglycemic seizure. Other diagnosis was tuberous sclerosis (2.7%), white matter changes (1.8%), adrenoleukodystrophy (0.9%), arachnoid cyst (0.9%), tuberculoma (0.9%) and HIE changes (0.9%). EEG abnormality was seen in 46% of patients. Hyponatremia (36%) was significantly associated with abnormal EEG changes. MRI was done in 38.7% of the patients, out of which, abnormality was seen in only 8.6% of the children.

Conclusions: Seizure is mainly diagnosed clinically and EEG can be normal in many patients. First episode of unprovoked seizure was common in age group of 1-5 years. EEG and Neuroimaging is useful for better diagnosis, treatment can be started on clinical diagnosis.

1. Introduction

Seizure is a disorder of brain characterized by a transient occurrence of sign and symptoms resulting from abnormal excessive or synchronous neuronal activity in the brain. Unprovoked seizure is occurring in the absence of precipitating factors. Epilepsy is a condition characterized by recurrent (two or more) unprovoked seizures occurring 24 hours apart.[1] Seizure is defined as abnormal paroxysmal neuronal discharge, which is clinically manifested by motor, sensory, autonomic or behavioral disturbances.[2]

Seizures are common in pediatrics age group and occur in 10% of children.[3] Half of these will occur during childhood and adolescence, and the highest risk before 1 year of age.[4–6] Approximately 30% of patients who have a first afebrile seizure later develop epilepsy; the risk is approximately 20% if the neurologic status, EEG and neuroimaging are normal.[7]

Comorbidities should be considered at all levels which include developmental delay, behavioural issues, academic difficulties and movement abnormalities. First episode of any seizure can leave behind tremendous mental and physical consequence to the child and the family. It requires the physician for a prompt proper evaluation and

* *Corresponding author*.
E-mail address: drbhupeshudr@gmail.com (B. Jain).

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management.

EEG abnormalities can be detected in up to 59% of children with first afebrile seizure and can identify subtle focality in presence of normal MRI. Neuroimaging has emerged as an important tool in emergency situation to detect any serious underlying condition for necessary intervention similarly non urgent neuroimaging can be deferred to later to detect abnormalities that may affect prognosis and hence useful in long term management.

Seizure characteristics in older children and adults are well described and classified. Evidence base studies and literature for profile of seizure in younger children are scarce. Hence, this study was planned with objective of the clinical and etiological profile of new onset unprovoked seizure and to find the association of EEG abnormalities and neuroimaging (MRI BRAIN) with clinical features in children aged 2 months to 18 years in a tertiary care hospital of South Rajasthan.

2. Materials and Methods

A hospital based longitudinal prospective study done at Balchikitsalya, R.N.T Medical College and MBGH, in Udaipur, Rajasthan for a period of 1 year from Nov. 2021 to Oct. 2022 after ethical committee clearance (RNT/Stat./IEC/2021/444).

First unprovoked seizure (seizure is occurring in the absence of precipitating factors), age group of 2 months to 18 years, Parents/patients willing to give consent were included in this study. Febrile seizure and previous history of seizure, Seizure mimics**,** Trauma**,** Parents/patients not willing to give consent were excluded from this study.

A detailed clinical history and physical examination were assessed on a prestructured proforma including patients name, age, gender, description of seizure like onset of seizures, type of seizures, duration of seizures, past history and family history, consanguinity, birth history, developmental history, immunisation status, dietary history was taken. General physical examination including vitals, anthropometry, neurocutaneous markers and systemic examination were done in all patients.

Biochemical investigations like blood sugar, ABG, complete hemogram, serum electrolyte, serum calcium were obtained. EEG was done in all patients. Magnetic resonance imaging (MRI) Brain and lumber puncture for cerebrospinal fluid analysis was done as when required.

Children were classified based on latest guidelines of ILAE and started on antiepileptic drugs accordingly.

The data were compiled on MS Excel Sheet and analysed by SPSS version 20 and P value <0.05 was considered statistically significant.

3. Results

During this study total numbers of patients enrolled were 111, who fulfilled the inclusion criteria. In this study 36% patients belonged to 1-5 year age group followed by 28.8% patients 6-10 year age, 25.2% patients above 10 year of age. Only 9.9% patients were <1 year. Majority of patients were males 63% while only 37% were females (M: F ratio 1.7:1) (Figure 1).

In our study, about 97% of children who presented with first episode of seizure did not have any similar complaints of seizure disorder in family. Majority of patients was belong to upper lower class (43.2%) followed by lower middle class (25.2%), upper middle (18.1%), lower lower (10.8%) and upper class (1.8%) according to modified kuppuswamy scale.

Most of the patients (89.2%) had GTCS type of seizures on admission in our department followed by focal seizures (5.4%), absence seizures (4.5%) and only (0.9%) patient had myoclonic seizures on admission (Figure 1).

In our study 36% patients had <135mEq/L sodium concentration, 7.2% had >145mEq/L sodium concentration. 9% patients had <3.5mmol/L potassium concentration, 3.6% patients had >5.5mmol/L potassium concentration. 13.5% patients had <8mg/dl calcium concentration, 1.8% patients had >11mg/dl calcium concentration (Table 1).

In total 111 patients, 51 patients had abnormal EEG, among them 45 show GTCS type of seizure, burst suppression pattern (2 Cases), focal seizures (2 Cases) and encephalopathy changes (1 Case) and Hypsarrhythmia pattern (1 Case) (Table 2 & A).

MRI Brain was done in 43 patients and majority of patients (79%) had normal MRI brain. Only 9 patients (21%) show abnormal changes in MRI Brain. Most common finding was suggestive of Tuberous sclerosis (3 patients) followed by 1 case of Adrenoleukodystrophy, Tuberculoma, Arachnoid cyst, Post ictal oedema, White matter changes and HIE changes (Table 3 & A).

A total of 111 cases enrolled in our study. In which most common diagnosis was seizure disorder in 78 pts (70.2%) [Generalised 76 pts (97.4%) > Focal 2 pts (2.6%)] followed by 13.5% hypocalcemic seizure, 8.1% hypoglycemic seizure. Other diagnosis was tuberous sclerosis (2.7%), adrenoleukodystrophy (0.9%), post ictal oedema (0.9%), arachnoid cyst (0.9%), tuberculoma (0.9%), HIE changes (0.9%) and white matter changes (0.9%) (Table 4).

4. Discussion

In our study majority of the patients (36%) belonged to 1-5 year age group, followed by 6-10 year age group (28.8%) and 24.3% patients belonged to >10 year with male predominance (67%) in all age groups. Adhikari et al,[8] Chung B et al and Saravanan S et al found similar

Table 1: Electrolyte level

Electrolytes		Numbers	Percentage
	<135mEq/L	40	36%
Sodium	135-145mEq/L	63	56.7%
	>145mEq/L	8	7.2%
	<3.5mmol/L	10	9%
Potassium	3.5-5.5mmol/L	97	87.3%
	>5.5mmol/L	4	3.6%
	<8mg/dl	15	13.5%
Calcium	8-11mg/dl	94	84.7%
	>11mg/dl	2	1.8%

Table 2: EEG inpatients

EEG	Numbers	Percentage
Normal	60	54%
Abnormal	51	46%
Total	111	100%
A – EEG findings		
EEG findings		**Numbers**
GTCS type of seizure		45 (88.2%)
Burst suppression		2 (3.9%)
Focal seizure		2 (3.9%)
Encephalopathic change		1 (1.9%)
Hypsarrhythmia		1 (1.9%)
Total		51 (100%)

Table 3: MRI in patients

MRI	Numbers	Percentage
Normal	34	79%
Abnormal	9	21%
Total	43	100%
A – MRI Findings		
MRI findings		**Numbers**
Tuberous sclerosis		3
Post ictal oedema		1
Adrenoleukodystrophy		1
Arachnoid cyst		1
Tuberculoma		1
Hypoxic ischemic changes		1
White matter changes		1
Total		9

Table 4: Final diagnosis

Diagnosis	No. of cases	Percentage
Seizure Disorder	78	70.2%
Hypocalcemic Seizure	15	13.5%
Hypoglycemic Seizure	9	8.1%
Tuberous sclerosis	3	2.7%
Post ictal oedema	1	0.9%
Adrenoleukodystrophy	1	0.9%
Arachnoid cyst	1	0.9%
Tuberculoma	1	0.9%
Hypoxic ischemic changes	1	0.9%
White matter changes	1	0.9%
Total	111	100%

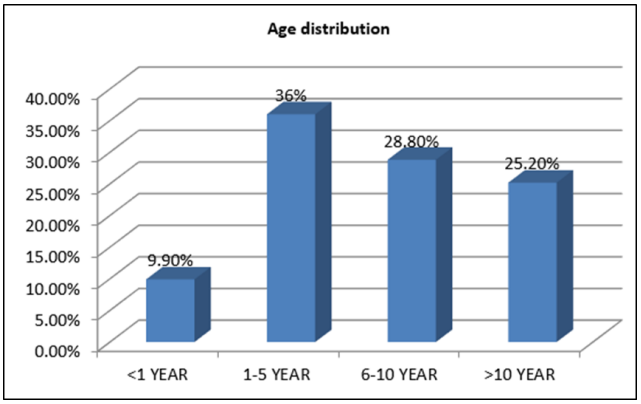

Fig. 1: Age distribution

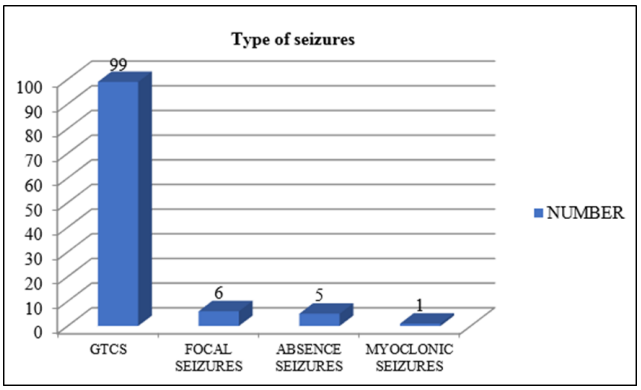

Fig. 2: Types of seizures

observation.

Out of 111 patients, maximum patients 99 (89.2%) had GTCS, 6 patients had focal seizures, 5 patients had absence seizures and only 1 patient had myoclonic seizures at the time of admission. These findings are similar to study of Choudhary P et al[9] where 65.2% presented with generalized seizure and 34.8% with partial seizure.

Developmental history of patients in our study states that 90.09% had normal development, 5 patients had delayed development. Delayed achievement of milestone was seen in 4 patients and 2 patients show regression of mile stone. Similarly in study of Bailet LL et al, [10] Bromley RL et al and Nickels KC et al.

We found 2.7% patients had family history of seizures. Similarly in study of Mwipopo EE et al, [11] only 8% of the children had a family history of seizures.

In our study, Anemia (Hb <11 g/dl) was found in 59 patients (53.2%). we found a non-significant association of Hb level with abnormal EEG and MRI. Hypoglycemia was seen in 9 patients (8.1%), while there was non-significant association of Hypoglycemia and Hyperglycemia with abnormal EEG and MRI

In our study Hyponatremia (Na^+ < 135mEq/L) was seen in 40 patients (36%) and there was a significant association

with Abnormal EEG and MRI (p value = 0.04). Similarly in study of Halawa et al[12] 3 of 120 (2.5%) patients with serum sodium from 115–119mmol had seizures, as did 3 of 54 (5.4%) with serum sodium of 110–114mmol. Using serum sodium levels between 120 and 124mmol as reference, they found a gradual increase in risk with falling serum sodium levels rather than a distinct cutoff.

Hypocalcemia (S Ca^{2+}<8.0gm/dl) was seen in 15 patients (13.5%) in our study. there was a non-significant association with Abnormal EEG and MRI. According to Mrowka M et althe symptoms of hypocalcemia depend on the degree of hypocalcemia and the speed of the decrease in the serum calcium concentration.

In our study out of 111 patients, 51 patients had abnormal EEG, among them 45 patients (88.2%) show GTCS type of seizure, burst suppression pattern (2 Cases), focal seizures (2 Cases) and encephalopathy changes (1 Case) and Hypsarrhythmia pattern (1 Case). In Study of Prasanna R. et al, they found EEG tracing was abnormal in 62 out of 105 children. 19 out of 62 had recurrence while only 2 among 43 normal EEG had recurrence. Baheti R et al., observed that 76.9% of children had abnormal EEG in generalized seizure group and 73.0% of children had abnormal EEG in partial seizure group. Betting LE et al observed that 33% of children with idiopathic generalized seizure having EEG abnormality. In a study done by Shinnar S et al EEG abnormality was observed in total 42% of children. Among children with abnormal EEG, 56% had partial seizure and 35% had generalized seizure and the difference was statistically significant.

Similar study done by Muniswamappa JK et al, in 80 children and found about 58.7% children had EEG abnormality with majority showing generalized discharges (23.7%). In study of Dwivedi R et al. among 98 children included in study, 29 (48%) had generalised EEG changes, 14 (22%) had focal EEG changes and 18 (30%) had normal EEG. There was significantly high incidence of focal EEG changes in partial seizure group compared to generalize.

MRI Brain was done in 43 patients out of 111 and among 43 patients, 9 (20.9%) patients show abnormal MRI Brain. Most common finding was suggestive of Tuberous sclerosis (3 pts) followed by 1 case of Adrenoleukodystrophy, Tuberculoma, Arachnoid cyst, HIE, Post ictal edema and White matter changes. MRI brain was done in 58 children and only 5 had abnormal findings in a study done by Muniswamappa JK et al. Among MRI brain findings tuberculoma was noted in one (1.7%) child, periventricular leukomalacia in two (3.45%), sub ependymal tuber in one child (1.72%) and unilateral cortical atrophy with ventricular dilatation in one child (1.72%) in their study generalised seizure group.

In our study, most common diagnosis was seizure disorder in 78 pts (70.2%) [Generalised 76 pts (97.4%) > Focal 2 pts (2.6%)] followed by 13.5% hypocalcemic seizure, 8.1% hypoglycemic seizure. Other diagnosis was tuberous sclerosis (2.7%), adrenoleukodystrophy (0.9%), post ictal oedema (0.9%), arachnoid cyst (0.9%), tuberculoma (0.9%), HIE changes (0.9%) and white matter changes (0.9%).

Idiopathic epilepsy was noted in sixty-five (81.2%) children in a study done by Muniswamappa JK et al., 6 (7.5%) children had meningitis. About four (5%) children had electrolyte disturbance (hyponatremia), 4 children (5%) had CNS malformations and one child (1.2%) had tuberculoma. In Singh et al study, 66.4% had idiopathic epilepsy, 30% had meningitis, 1.2 % had hyponatremia and 2.7% children had tuberculoma.

5. Conclusion

The conclusion of our study is that first episode of seizure was more commonly observed in 1-5 years of age group and males were predominantly affected. Generalised types of seizure were the most common presentation. Positive family history of seizures, low socioeconomic status of parents, presence of neurocutaneous markers, Hypoglycemia and low serum calcium levels are the risk factors which were associated with Seizure episodes. Hyponatremia was significantly associated with abnormal EEG changes, therefore, assessment of serum electrolytes is of utmost importance for early diagnosis and treatment. Around 54% of patients had normal EEG despite of clinical seizures. Around 80% of patients had normal MRI, only 20% patients had abnormality on neuroimaging. Therefore, clinical evaluation of seizure semiology is more important than EEG and Neuroimaging. However, EEG and MRI are useful adjuncts for better understanding of childhood seizure and etiology.

6. Source of Funding

None.

7. Conflicts of interest

There are no conflicts of interest.

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Author biography

Ravikant Sankhala, Resident

Bhupesh Jain, Associate Professor https://orcid.org/0000-0001-5773-6148

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