Clinical categorisation and etiology of seizures in children admitted at a tertiary care centre in North Karnataka

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Abstract

Background: Seizure is a common problem evaluated in pediatric emergency departments. Seizure disorders are among the most frequent neurologic problems that occur in childhood. Around 4 to 10% of children experience at least one episode of seizure in the first 16 years of their life.

Objectives: To study clinical and etiological profile of children presenting with seizures.

Material and Methods: A total of 126 consecutive children aged 1 month to 18 years presenting with seizures defined as per international league against epilepsy classification, participated in this study. A detailed history was taken, and clinical examination was done, along with the investigation for the aetiology of seizures with routine and specific tests, computerized tomography (CT) scan and/or magnetic resonance imaging (MRI) and electroencephalography (EEG) as and when needed.

Results: In our present study, we recorded the highest incidence of seizures in the age group of 1year to 5 years. The incidence of seizures in our study was more in males, accounting for 73 cases (57.4%) while females were 53 cases (42.06%). Generalized seizures were the commonest, among them GTCS accounting for 88 cases (69.84). The identified major etiologic factors were febrile convulsions followed by CNS infections.

Conclusion: The incidence of convulsions is highest in the age group of 1 month to 5 years and in males. The commonest type of seizure is generalized tonic-clonic (40.6%).The most common cause of convulsion is febrile seizures. Milestones were achieved normally in majority of cases.

Key words: seizures, status epilepticus, Generalized seizures, Focal seizures, MRI, CT scan, ILAE classification

Introduction

Seizure is a common problem evaluated in pediatric emergency departments[1]. Seizure disorders are among the most frequent neurologic problems that occur in childhood. 4 to 10% of children experience at least one episode of seizure in the first 16 years of their life.

A seizure or convulsion is a paroxysmal, time-limited change in motor activity and/or behavior that results from abnormal electrical activity in the brain[2]. It is defined as abnormal neuronal firing leading to a clinical alteration of neurologic function (motor, sensory, autonomic, or psychological). It also reflects aberrant activity at the level of both single neurons and the neuronal network[3]. The manifestation of the seizure depends upon the threshold of the brain to manifest a clinical seizure. The age and neurodevelopment maturity status determine the clinical manifestations and the type of seizure disorders encountered[4]. They account for 1% of all emergency department visits[5], and about 2% of visits of children's hospital emergency department visits.

Our present study is based on this new classification, which originates from a draft document submitted for public comments in 2013, which was revised to incorporate extensive feedback from the international epilepsy community over several rounds of consultation. It presents three levels, starting with seizure type, where it assumes that the patient is having epileptic seizures as defined by the new 2017 ILAE Seizure Classification. After diagnosis of the seizure type, the next step is diagnosis of epilepsy

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type, including focal epilepsy, generalized epilepsy, combined generalized, and focal epilepsy, and also an unknown epilepsy group. The third level is that of epilepsy syndrome, where a specific syndromic diagnosis can be made. The new classification incorporates etiology along each stage, emphasizing the need to consider etiology at each step of diagnosis, as it often carries significant treatment implications. Etiology is broken into six subgroups, selected because of their potential therapeutic consequences. Newterminology is introduced such as developmental andepilepticEncephalopathy[6].

Worldwide, febrile seizures are the most commontype of acute seizures in children[7,8]. Central nervoussystem (CNS) infections are the main cause of seizuresand acquired epilepsy in the developing world[9].

The type of seizure, its etiology, manifestations and progression varies from age to age. There are very few epidemiological studies looking at the incidence of seizure in India. The limited data show that the incidence and prevalence rates are surprisingly similar to those in developed countries.

This study was done in tertiary level hospital with the aim to study the clinico-etiological profile of seizures in children from 1 month to 18 years of age. It also helps in prognostication and outcome.

Materials and Methods:

The study was a Descriptive study conducted at Basaveshwar teaching & general hospital and Sangameshwar teaching & general hospital, Kalaburagi, Karnataka.126 cases were studied over a period of 18months with the following inclusion criteria: Age group between 1 month to 18 years presenting with Seizures. Seizure semiology was defined and classified according to the 2017 ILAE seizure classification. The final diagnosis and etiology of each child were confirmed with the investigations available. A detailed history was taken from parents about the semiology of seizures, birth history, developmental history, and significant past history of neuroinfections and head injury. Clinical examination was done for assessment of sensorium, any neurological abnormality, signs of meningeal irritations, presence of neurocutaneous markers and/or associated illness by a pediatric neurologist. These children were investigated for the etiology of seizures with routine and specific investigations including blood profile, Mantoux test, cerebrospinal fluid analysis, blood glucose, serum calcium, electroencephalography (EEG) and with neuroimaging, CT scan/ magnetic resonance imaging (MRI). All the findings were recorded in a pre-designed proforma and results were analyzed.

Results

The incidence of convulsions was highest in the age group of 1-5 years, 65 cases (51.59%), whereas the lowest distribution is seen between the age group of 10-18 years, 13 cases (10.32%). The occurrence of seizures was highest in males, 73 cases (57.94) compared to females, 53 cases (42.06%). In the present study, PEM is classified according to IAP classification, among them, 118 cases were normal (93.65%), 5 cases were graded as PEM I(3.9%), 2 cases graded as PEM II (1.5%) and 1 case as grade PEM III (0.7%).

The majority of the cases had generalised onset accounting for 83.3%, GTCS being commonest: 88 cases (69.8%), followed by tonic convulsion :12 cases (9.54%), clonic and myoclonic :2 cases (4%) each, least being atonic convulsion :1 case (0.7%). Focal seizures accounting for 16 cases (12.6%), among them, 13 cases had impaired awareness, with tonic accounting for 6 cases (4.7%). Cases of focal seizure with intact awareness were least and clonic type accounting for 3 cases (2.3%). 5 cases were generalised status epilepticus.

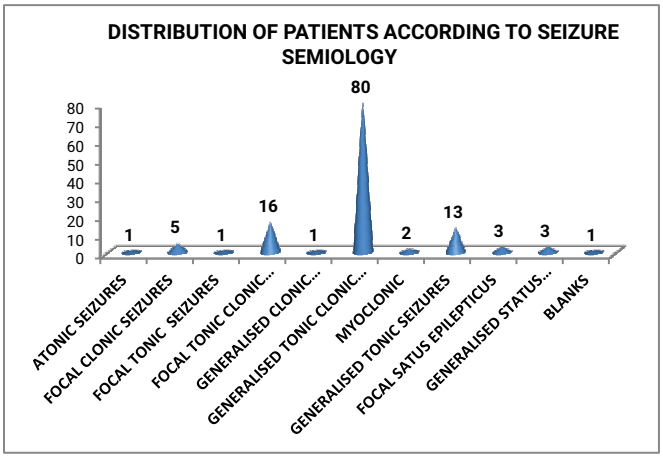

Figure 1: Distribution of patients according to seizure semiology.

In this study, 113 cases were normal 89.68%. 13 cases had Global developmental delay: 10.32%, among them, 3 cases had microcephaly (<3SD) and 3 cases accounted haddysmorphism (2.3%). In the present study, out of 126 cases, 33 cases had a past history of seizures which accounted for 26.19%. The majority of cases had the first presentation of seizures. In the present study, only 14 (11.1%) cases had a positive family history of convulsions and the rest 88.8% of cases had no family history of seizures. In this study, 15 cases (11.9%) had second-degree consanguineous marriage and 17 (13.4%) cases had third-degree consanguineous marriage. Fever was the predominant symptom: 109 cases (86.51%),

followed by cold and cough: 23 cases (18.25%), loose stools:18 cases(14.2%), vomiting: 17cases (13.4%). In this study, peripheral smear of anemic cases who presented with convulsion commonly had normocytic normochromic picture accounting for 57 cases (45%), followed by microcytic hypochromic picture 38 cases (30%). All the patients who presented with seizures had serum glucose estimation and serum glucose less than 60, were considered hypoglycaemic (2.5%) and cases with more than 60 were considered euglycemic. In the present study, sodium levels less than 135, were considered hyponatremia and more than 145 were considered to be as hypernatremia. 28.5% werehyponatremic and only 4 cases presented with seizures (3.17%). 22 cases had hypocalcemia, of which only 1 case presented with seizures (0.79%). Majority of the cases had normal calcium levels. In the present study, EEG was performed in 40 cases, majority being normal 60%. Among abnormal patterns, 13 cases (32.5%) had generalized epileptiform discharges. Of the 65 cases, 32 cases (49%) had CT scan and 33 cases (50.7%) had MRI scan, of which, cerebral edema accounted for 4 cases (3.1%), hydrocephalus for 3 cases (2.3%), and rest cases had normal findings. In our study, febrile seizures and CNS infections were the major causes between 1 month to 18 years. Febrile seizure is the commonest etiology accounting for 43.6%, among them simple febrile seizure accounts for 81%, followed by complex febrile seizure 16%, least is an atypical febrile seizure. Second most common cause is CNS infections (13.4%), among infections, encephalitis accounts for 58.8%, dengue encephalitis being major among them 60%, rickettsial encephalitis 20%, HSV encephalitis & Japanese encephalitis accounted for 10% each. Meningitis (41.1%), among them dengue meningitis cases were 60%, rickettsial encephalitis (20%), HSV and Japanese encephalitis accounted for 1case(10%) each. Perinatal insult accounted for 4.7% of the total. Among 126 cases, epilepsy accounted for 10.3%, major being genetic 76%, followed by structural and idiopathic epilepsy.

Under space-occupying lesions: 5 cases (3.9%), we had neuroimaging confirmed cases of two gliomas and one each case of congenital hydrocephalus rest we had two cases of vitamin b12, mesial temporal sclerosis, PRESS, suspected dravet syndrome and SSPE each. A case of electrical status epilepticus diagnosed on EEG.

Table 1: Etiological classification

ETIOLOGY	Number of patients	Percentage
FEBRILE SEIZURE	-	-
Simple febrile seizure	45	35.71
Complex febrile seizure	9	7.14
Atypical febrile seizure	1	0.79
CENTRAL NERVOUS SYSTEM (CNS) INFECTIONS	-	-
Meningitis	-	-
Pyogenic meningitis	3	2.38
Tubercular meningitis	2	1.59
Meningococcal meninigitis	1	0.79
Fungal meningitis	1	0.79
Encephalitis	-	-
Dengue encephalitis	6	4.76
Rickettsial encephalitis	2	1.59
HSV encephalitis	1	079
Japanese encephalitis	1	0.79
METABOLIC	-	-
Hyponatremia	4	3.17
Hypocalcemia	1	0.79
Hypoglycemia	2	1.59
MELAS **(Mitochondrial encephalomyopathy, lactic acidosis, stroke)**	1	0.79
PERINATAL INSULT	-	-
Birth asphyxia	2	1.39
Cerebral Palsy	4	3.17
EPILEPSY	-	-
Genetic epilepsy	10	7.94
Structural epilepsy	2	1.59
Idiopathic epilepsy	1	0.79
SOL		
Gliomas	2	1.59
Congenital hydrocephalus	1	0.79
Tumor	1	0.79
Cerebral trauma	1	0.79
Vitamin b12 deficiency	1	0.79
MTS	2	1.58
Suspected DRAVET syndrome	2	1.59
PRESS	2	1.59
SSPE	2	1.59
Electrical status epilepticus	1	0.79
others	12	95.2
Total	126	100

Discussion

This was a hospital-based observational study conducted at a tertiary care hospital in the department of paediatrics, MRMC, Kalaburagi. Among 126 cases, we recorded the highest incidence of seizures in the age group of 1year to 5 years. A study done by Sailakshmiananya et al stated that children between 2 months and 5 years (58%) showed highest incidence.

Male preponderance (57.85%) was seen, which was similar to studies conducted by Adhikarietal[10], Nepal and Ernestina et al[11]. The Yelandur survey found that there was male preponderance (72%) in cases with active epilepsy[12].The study done by Gowda et al[13], also reported a male predominance in the ratio of 1.2:1. It was found that the occurrence of convulsions is highest in 72 cases (60%) in the age group of 1–5 years.

29% had a past history of convulsions. The reason for this could be due to the fact that conditions like epilepsy and febrile convulsions are known to have recurrent seizures. These two conditions formed major etiological group in our studies. Annegers et al found a recurrence rate of 25% in a cohort of 639 children that was prospectively followed. In our study, 9% of total cases had a family history of convulsions. In a large series studied by Chevrie and Aicardi, a positive family history of seizures was present in 28% of infants.

Developmental history was normal in 89.6% of cases, while 10.3% had delayed developmental milestones, the same was attributable to perinatal insult, cerebral malformations, syndromic associations. Dysmorphism was seen in 3 cases. Seizure type assessment revealed that generalized seizures were the most common (69.8%), which was similar to thestudies conducted by Adhikarietal[10]. Idroet al[9] and Saravanan[14]. Focal seizures were observed in 12.6%. In our study, majority of the patients presented with fever :109 cases(86.5%), followed by vomiting: 17 cases (13.4%), Irritability (24.2%), Cough and cold:23cases (18.25%), loose stools: 18cases (14.29%), altered sensorium: 2 cases (1.59%) and headache 8 cases (6.35%) were the other minor symptoms

EEG was done in 40 cases, of which 13cases (32.7%) had generalized epileptiform discharges, focal discharges accounted for 2 cases (5%), 3 Hz spike and wave pattern accounted for 1 case (2.5%) and majority were normal with no abnormality and a case diagnosed as status electrical epilepticus. Similar studies were found by Prasad muley et al[15]

In our study, febrile seizures were the most common cause of convulsions accounting for 43.6% of all our cases. Febrile seizures are reported to be even more common in Asian Countries[16]. Viral encephalitis is another major cause of convulsions in children. The incidence of viral encephalitis in India is unknown because of problems in establishing the viral diagnosis. In our study of 126 cases, 10 (7.9%) cases of viral encephalitis were identified, which accounted for about 58.8% of CNS infections. In a study done by Idro R et al (2008), it has been reported that meningitis and encephalitis are common reasons for childhood mortality and morbidity. In the present study, 3% of the patients presented with meningitis and these results are in agreement with a prior South Indian study done by Kumar et al study, bacterial meningitis accounted for 5.5% of the total (41.1%) CNS infections. Among them, pyogenic meningitis accounted for 42.8%, tubercular meningitis for 28.5%, meningococcal meningitis and fungal accounted for 0.14% of CNS infections. Among 40 cases of viral encephalitis, dengue serology was positive in 55% of cases and Japanese encephalitis serology in 7.5%.

28.5% werehyponatremic and only 4 cases presented with seizures. Similar uncommon and minor electrolyte abnormality was found in Norah et al (2005). 22 cases (17.46%) are hypocalcemic and only 1 case presented with seizures, which was similar to a study conducted by Prasanna Ret al[17].

In the present study, space occupying lesions accounted for 3.9%.Among them gliomas accounted for 40%, followed by congenital hydrocephalus and tuberculomas, the least being cerebral trauma. In study conducted by Chandrashekhar Koliet al, 9.8% of the patient with symptomatic seizure disorders showed SOL which was mainly diagnosed as Tuberculoma as a causative factor.

Cerebral palsy (CP) is the most common neurologic disorder associated with epilepsy. The frequency of epilepsy in CP varies from between 15% and 60% of patients. Neuroimaging was performed in 56 cases, in which, cerebral edema accounted for 4 cases (3.1%), hydrocephalus 3cases (2.3%), intracranial bleed and mesial temporal sclerosis 2cases (1.59%) each. The majority of neuroimaging turned out to be normal. Imaging aids are an important tool to aid etiological diagnosis of afebrile seizures.

Conclusion:

Seizures are the most common pediatric neurological disorder worldwide. They are also one of the most frequent causes for visit to the emergency department. The aetiology of seizures are various and are different for each age group. Febrile convulsions are the most common seizures seen in children below 5 years of age. Patients with convulsions need

aggressive stabilization, resuscitation and concurrent implementation of diagnostic testing, monitoring and pharmacological intervention. Thorough evaluation, including careful history, physical examination, laboratory work-up, electroencephalograph and neuroimaging studies as indicated by clinical suspicion are required to identify the underlying pathology causing seizures.

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