ORIGINAL ARTICLE

Study of Clinical Profile of Epilepsy in Children Admitted in Pediatric Intensive Care Unit and Pediatric Ward in a Tertiary Care Hospital

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Abstract:

Introduction: Seizures constitute the commonest neurological problem in children and most common neurological emergency attended by Paediatrician. Because of unpredictability of recurrence ,varied manifestation and underlying etiology, seizure disorder was always shrouded in mysticism and false beliefs. Present study was done to know seizure type, etiology , EEG and MRI findings in Paediatric population admitted in PICU and Paediatric ward of a tertiary care Hospital. *Methodology:* It was descriptive study from April 2019 to September 2020.Study protocol was approved by Institutional Ethics Committee.*Results:* 60 patients with Epilepsy admitted in Paediatric intensive care unit and Paediatric ward were included in the study. Mean age of children in this study was 5.6 years (+/- 4.76 years), 70% were males. Generalised motor type of epilepsy was most common type of presentation (95%) while focal to generalised was 5% (According to International League Against Epilepsy 2017 Classification).Out of Motor type tonic-clonic were 55(94.6%),epileptic spasms were seen in 2(3.6%) while absence seizures was seen in 1(1.8%).Epileptic syndrome was seen in 5(8.7%)Most common type of etiology was Genetic53(88%).EEG findings in 23(38.5%) were Generalised slow-waves and generalised bursts in 17(28.3%) and normal in 8(13.35%). MRI findings were normal in majority of patients 49(81.6%).*Conclusion:* Most common type of etiology was Genetic (ILAE-2017).Commonest presentation was Generalised motor tonic-clonic and most common type of EEG finding was Generalised slow wave discharges. Magnetic Resonance Imaging (MRI) brain findings were normal in majority of patients 49 (81.6%). MRI brain should be done only in selected patients with history of birth asphyxia, structural abnormalities of brain, global developmental delay and Microcephaly.

Keywords: Epilepsy, Seizures, Magnetic resonance Imaging (MRI), Electroencephalogram(EEG), International League against Epilepsy-2017(ILAE-2017).

Introduction:

Seizure is an excessive hyper synchronous electrical discharge from an aggregate of central nervous system neurons. Each burst of electrical activity is called seizure. If seizure arises from motor cortex, leading to abnormal motor activity it is called as convulsion. Epilepsy is defined as “two or more unprovoked seizures at an interval of more than 24 hours apart”[1]. The operational clinical definition of epilepsy can be by any of the following conditions: At least two unprovoked (or reflex) seizures occurring >24 hours apart. One unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk (at least 60%) after two unprovoked seizures, occurring over the next 10 years. Highest incidence of seizures occurs in early childhood and late adulthood. Seizures occur in 10% of children. Less than one third of seizures are caused by epilepsy[1] . Epilepsy incidence is 0.3- 0.5% and prevalence is 5-10 persons per 1000[1] . The cumulative lifetime incidence of epilepsy is 3%; more than half of cases begin in childhood . In childhood seizures 10-20% are persistent seizures, refractory to drugs that pose a diagnostic and management challenge. A recent meta-analysis puts the overall prevalence of epilepsy in India at 5.59 per 1000 population. The worldwide prevalence of active epilepsy is 4-10 per 1000 population[2] .Studies from different parts of India reveal that the prevalence of seizure disorders varies from 9/1000 in Bangalore, 5/1000 in Mumbai, 3/1000 near Calcutta to 4/1000 in New Delhi in 2001.At the global level, it is estimated that there are nearly 50 million patients suffering from seizure disorders of which three- fourths, that is 35 million, are in developing countries. It accounts for 1% of the total global burden of all diseases. It is estimated that India alone has 10 million cases suffering from seizure disorder[3] . An estimated 2.4 million new cases of seizure occur each year globally. At least 50% of cases begin in childhood or adolescent age group. Of the total seizure patients, 70% to 80% could lead normal lives if properly diagnosed and treated. Still due to misbeliefs and unawareness, 60% cases of seizure disorders remain untreated in developing countries[4].The etiology, clinical pattern, treatment of epilepsy varies with age and

childhood epilepsy differs sharply from others[6] .However there is little information available regarding childhood epilepsy. Diagnosis of epilepsy is largely based on clinical manifestation. Electro physical investigations support the diagnosis of the Epilepsy syndromes. Brain imaging is only able to identify the structural cause of the epilepsies. A precise therapy with appropriate antiepileptic drugs with optimal dose and duration can reduce the neurological morbidity to a great extent in children [7].There is a paucity of data regarding early childhood epilepsy in India. The purpose of the present study was thus to observe the clinical and imaging profile of early childhood epilepsy in a tertiary care hospital and to classify epilepsy according to International League Against Epilepsy 2017 Classification. All these findings were taken from a tertiary care centre. These findings will be helpful for further research in a large scale in the field of childhood epilepsy.

Material and Method:

It was descriptive study done from April 2019 to September 2020 in a tertiary care hospital this study protocol was approved by Chairman, Institutional Ethics committee. Children of age from 1 month to 18 years admitted in Pediatric ward and PICU who gave informed consent were included in study.

Children with febrile seizure, (simple and complex) metabolic seizures (hypoglycemic, hypocalcemic, hyponatremic hypernatremic etc), infection provoked seizures (meningitis, encephalitis), Seizure mimics (breath holding spells, migraine syndromes, narcolepsy, benign sleep myoclonus etc) were excluded from study. An appropriate informed consent or ascent in a prescribed format was obtained from parents/ patients who fulfilled inclusion criteria. After inclusion in the study, a thorough detailed history of duration of seizure, onset of seizure semiology: Seizure activity, loss of sensorium, tonic-clonic posturing, bowel and bladder incontinence, provoked by hyperventilation etc.,was taken in to consideration. A Past history suggestive of Encephalitis, Head injury, Stroke, complex febrile seizures etc.,was noted. If the patient had history of seizures in the past detailed treatment history (medications prescribed, compliance to treatment, response to treatment) was recorded in proforma.Family History of consanguineous (or) non- consanguineous marriage and family history of seizures was also noted. Developmental History (fine motor, gross motor, social and language milestones and in a school going child history of regression of scholastic performance) was taken. Detailed antenatal history (especially of TORCH infections), intranatal history (Birth asphyxia, meconium aspiration, prolonged labour) and postnatal history (hypoglycemia) was taken in to consideration This was followed by anthropometric assessment, detailed General examination- vital parameters, skin markers-neurofibromas, shagreen patch, haemangioma, cataracts, adenoma sebacaeum, dysmorphic features were noted. Then a detailed Central Nervous system examination which included examination of Higher functions, Cranial nerves, motor system, Sensory system, Cerebellar signs, examination of gait was done. Developmental age of the child was assessed and soft neurological signs were looked for. Diagnosis was made according to ILAE 2017 classification as generalized, focal, unknown, unclassified and epileptic syndromes. If history and examination was suggestive of epilepsy, patient was subjected to EEG from Electro-physiology department and Radio-imaging (MRI) of the Radiology Department at Bharti Hospital. EEG was reported by neurophysician at our hospital.CSF and other investigations (serum ammonia serum lactate, serum pyruvate , ABG etc.) was done as and when required. Fundoscopy from ophthalmologist was done. Intelligent Quotient/Developmental Quotient (IQ/DQ) was evaluated by trained child psychologist at our hospital If a child is known case of epilepsy and is admitted for recurrent seizures, status, or any other systemic illness, the child was included in our study. Any new investigations which were not done previously done if necessary.

Sample size was estimated with the following formula:

$$n = \frac{(Z_\alpha)^2 * p * q}{(L)^2}$$

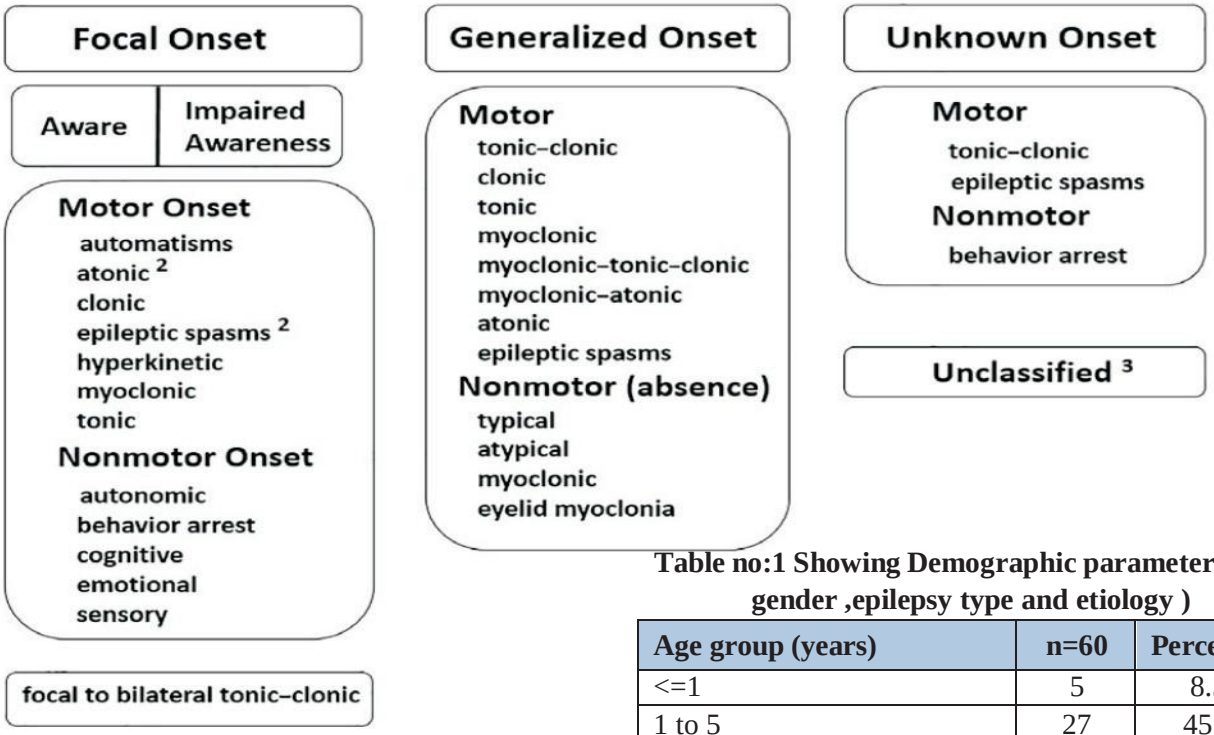
Z_α = 1.96, type I error at 5% level of significance
p =59% (% of generalized tonic clonic)
q =100-p=41%
L= Allowable Error=13%
n= 57.25

So we decided to take sample size of 60 as a round figure. SPSS version 20.0 was the software used for data analysis. Convenient sampling technique was used. Subjects were selected according to their availability and accessibility. Epilepsy was classified according to ILAE 2017 Classification.

Results:

Out of the total 60 cases, 70% were males while 30% were females. Mean age of the study cases was 5.6 years with 8.3% cases being less than 1 year of age while 46.7% cases were over 5 years. Most common epilepsy onset type seen in present study were generalized (95%) followed by focal type (5%). There were 14 cases with status epilepticus as presentation.Associated syndromes seen in present study were WEST syndrome (3.3%), Dravet syndrome (3.3%) and Landau Klefner syndrome (1.7%).Out of the 57 cases of generalized onset, 55 (96.5%) were tonic clonic type motor seizures, 1 case each had an epileptic spasm and absence (non-motor) seizure. Most common etiology for epilepsy observed in present study was genetic (88.3%)

Figure No: 1- Explaining Classification of Epilepsy according to ILAE Classification 2017.



*ilea.org-ILAE Position paper (Epilepsia,58(4):512-521,2017 doi:10.1111/epi.13709).

Table no:2 Showing type of generalised epilepsy

Generalized Epilepsy	n=57	%
Motor-type (tonic-clonic)	55	94.6%
Motor type (Atonic)	0	0.0%
Epileptic spasms	2	3.6%
Non-motor (Absence)	1	1.8%
Total	57	100.0%

Table no:3 Showing Epilepsy syndromes

Syndromes	n=60	%
West Syndrome	2	3.3%
Dravet's Syndrome	2	3.3%
Landau klefner syndrome	1	1.7%
Doose Syndrome	0	0%
Lennox-Gastaut syndrome	0	0%

followed by metabolic (3.33%) and structural causes (5%).[According to ILAE 2017 Classification]Out of 60 cases 3 cases had perinatal insult.Associated co-morbidities seen in present study were Intellectual

Table no:1 Showing Demographic parameters.(age, gender ,epilepsy type and etiology)

Age group (years)	n=60	Percentage
<=1	5	8.3%
1 to 5	27	45.0%
5 to 10	17	28.3%
11 to 18	11	18.3%
Total	60	100.0%
Mean age SD = 5.6 years (+/- 4.76 years)		
Gender	**n=60**	**%**
Female	18	30.0%
Male	42	70.0%
Total	60	100.0%
Epilepsy Type	**n=60**	**%**
Generalized	57	95%
Focal to Generalized	3	5%
Focal	0	0%
Unclassified	0	0%
Total	60	100.0%
Etiology	**N=60**	**%**
Genetic	53	88.3%
Metabolic	2	3.33%
Immune (NMDA receptor antagonist)	1	1.67%
Immune(ADEM)	1	1.67%
Structural	3	5%
Infectious	0	0%
Unknown	0	0

[NMDA=N-methyl D Aspartate ADEM=Acute disseminated encephalomyelitis]

Table no:4 Showing EEG and MRI findings in Epilepsy patients

EEG Findings	N=60	%
Generalized Bursts & Waves	17	28.34%
Generalized slow waves	23	38.3%
slow amplitude delta waves	9	15%
Hypsaryythymia	2	3.33%%
3-HZ spike and wave complexes(Absence seizure)	1	1.67%
Normal	8	13.33%
Total	60	100.0%
MRI Findings	**N=60**	**Percentage**
ADEM (Hyperintensities in Bilateral Thalami)	1	1.67%
Craniotomy defect in occipital region Shunt tube in Frontal horn of right ventricule1	1	1.67%
Periventricular leukomalacia	2	3.33%
Mesangial temporal sclerosis	1	1.67%
Multiple thalamic infarcts (Hypoxic ischemic encephalopathy)	1	1.67%
Cystic encephalomalacia in Right parietal lobe	1	1.67%
Bilateral sub-cortical cysts	1	1.67%
Schizencephaly	1	1.67%
Lissencephaly	1	1.67%
Porencephaly	1	1.67%
Normal	49	81.6%
Total	60	100.0%

disability (50%), developmental delay (45%), microcephaly (25%) ,Cerebral palsy (20%) and Attention defict (5%). Positive family history for epilepsy was given by 23.3% cases. Most common EEG findings in present study were generalized slow waves (38.3%) followed by generalised bursts & waves (28.34%) and slow amplitude delta waves (15%). Normal EEG was observed in 13.3% cases. Out of the total 60 cases, 51.7% were on Anti-epileptic medications. Most of the cases had a normal MRI (Magnetic resonance imaging) (81.6%). Hyper intensities involving bilateral thalami were seen in 1 case (1.67%), Structuraldefectswerenotedin3 cases(5%),periventricular leukomalacia was seen in 2 cases (3.33%). Thalamic infracts, cystic encephalomalacia, mesial temporal sclerosis and craniotomy defects were seen in 1 case each (3.3%) respectively and normal MRI in 49 cases (81.6%).

Discussion:

In the present study mean age of the study cases was5.6years(+/- 4.76 years), maximum frequency of caseswere in the age group of 1-5years (45%) , 5-10years(28.3%) 11-18years(28.3%) and less than 1 year cases were 8.3%.Most of the epilepsy cases were below 5 years,Our study is comparable with Ramesh et all [8] who observed occurrence of convulsions being highest (60%) in the age group of 1–5 years.Similar distribution was observed by Milda E et al. [10], who carried a study on seizure disorders in children aged 0–15 years of Kaunas city, where highest rate of seizures was found in the <5 years age group.Ahmed S et al. [7] who observed that majority cases were in the age group of 1 to 12 months (56%).Maximum number of cases were in ages ranged between six month and 12 years (mean SD 6.2±2.9) in the study by Gupta A et al. [8]. In our present study epilepsy was more prevalent in males (70%) followed by females (30%).Our study matches with Ahmed S et al. [7] who observed that majority cases were male (78%). In Gupta A et al. [83] out of 297 cases 196 (66%) of the study population were males and 101 (34%) were females. Kumar R et al. [9] study observed equal gender distribution. Ramesh S et al. [10] in their study observed that overall male predominance (male: female 1.3:1). Uttam K et al. male to female ratio was 1.9:1 [12].As per ILAE 2017 classification, we were able to classify 100% of the cases in our study. Most common type of onset of epilepsy seen in present study were generalized (n-57; 95%) followed by focal to bilateral (Combined) (n-3; 5%).Out of the 57 cases of generalized onset,54 (94.6%) were tonic-clonic type motor seizures, 2 cases had epilepticspasms and one case absence (non-motor) seizure. Our study matches with Ramesh S et al. [10]who observed 81.7% cases of generalised seizures and 18.3% cases of focal seizures. Our findings were also similar to other studies by Adhikari et al. and Mamillapalli et al. [13] where generalised epilepsy was the most common presentation. Gupta A et al. [8] in their study observed that majority of patients had generalized tonic-clonic seizure (71.71%). Only 3.7% cases were in unclassified category. Ahmed S et al. [7] in their study too observed that generalized seizures

(66%) as the most common type of initial seizures.In present study we had epileptic syndromes according to ILAE classification, like West syndrome was found in 3.3.% cases followed by Dravet's syndrome in 3.3% cases and Landau Klefner syndrome in 1.7% cases.In Shrivastava et al., representing pediatric population, most common syndromes observed was West syndrome (3%).In present study most common etiology for epilepsy observed in was genetic 53 cases (88.3%), structural etiology in 3 cases (5%) , neuro-metabolic (3.33%) and immune (ADEM and neurodegenerative) in 3.33% cases and 5% cases had history of perinatal insult.Kumar R et al. [9] in a similar study observed 84% cases with structural and genetic causes being the commonest etiology. Gupta et al. observed commonest causes for epilepsy were structural (91.7%) followed by genetic .Uttam K et al. [12] observed most cases were structural causes being predominant etiology (52%) while 16%. Adhikari et al. and Mamillapalli et al. [13]observed structural causes were the commonest etiology.In our present study ,most common EEG findings in present study were generalized slow waves (38.3%) followed by generalized bursts & waves (28 . 34 %) followed by slow amplitude delta waves(15%),hypsarrythmia in 3.33% cases and 3Hz spike and wave formation(absence seizure) in one case. Normal EEG was observed in 13.3% cases. Ramesh et all [16] observed EEG recording was done for 84 children. Of them, 38 (45.2%) children had an abnormal EEG recording in the form of spikes and sharp waves and 46 (54.8%) children were normal In our present study, most of the cases had a normal MRI (81.6%)and 2 cases(3.3%) had periventricular leukomalacia. One case each of Thalamic infracts ,cystic encephalomalacia, mesial temporal sclerosis and craniotomy defects ,scizencephaly, lissencephaly and porencephaly was seen. Kumar et all [13] observed MRI brain performed in 41 children; of them, 48.8% had normal MRI and 51.2% had abnormal MRI findings. In a study done by Chaurasia et al. in theBundelkhand region of North India, 271 children presenting with epilepsy were evaluated. MRI brain doneamong them revealed positive findings in 70.4% of the cases [15]. Saravanan conducted a study in Kanchipuram in South India and also reported that 25% of the children with seizures had abnormal neuroimaging findings [14]. Thus to summarize in our study epilepsy was more common in children below the age of 5 years with male predisposition. Generalized type was the most encountered form, genetic causes being the most commonly observed etiology. Global developmental delay and intellectual disability of varied levels were seen in almost half of the children with seizure disorders. Thus, a thorough evaluation is recommended in every child presenting with seizures to understand the clinico-demographic profile and the associated etiology, this should be accompanied by regular EEG monitoring.

Limitations of the study:

firstly the sample size is relatively small and secondly the results are not reflective of the general population due to hospital based nature of the study. Thus multi-centric or community based studies with larger sample size are recommended to overcome these limitations.

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