

A CLINICAL STUDY OF NEW ONSET SEIZURES IN CHILDREN IN A TERTIARY CARE HOSPITALArchana Reddy Damireddy¹, Sumanth Reddy Musali²¹Assistant Professor, Department of Paediatrics, SVS Medical College, Mahbubnagar, Telangana.²Assistant Professor, Department of General Medicine, SVS Medical College, Mahbubnagar, Telangana.**ABSTRACT****BACKGROUND**

Seizures in paediatric population is one of the most common health problems associated with diverse aetiological agents. aetiological spectrum varies from country to country. In India intracranial infections continue to be the most important cause for childhood seizures

The objectives of the study are- 1) To study the aetiological factors, age, sex distribution and clinical profile of seizures for new onset seizures in children aged 3-12 years. 2) To assess the role of EEG and Neuroimaging in children with new onset seizures. 3) To know the response to treatment and follow up in children with seizures.

MATERIALS AND METHODS

All children in preschool and school age group (children aged 3-12 years) presenting with new onset seizures were included. Data regarding their name, age, sex, address, type of seizures (according to international classification of epileptic seizures), past history of seizures, contact with tuberculosis, drug history, development history, family history were collected in a preformed proforma. Relevant investigations were done including blood investigations, radiological imaging, CSF analysis, EEG etc to identify the aetiological factors. Appropriate treatment was given to the patients and the cases were followed up for one year post treatment.

RESULTS

A total of 98 children formed the study group. Out of them 65 showed generalized seizures and 33 partial seizures. The mean age group at which generalized seizure occurred was 6.8 years. Only 13.3% of children had family history of seizure. Intracranial infections including granulomata were found to be leading cause of childhood convulsions (73%). Neurotuberculosis still occupied the top chair followed by neurocysticercosis. Generalised tonic clonic seizures were most common presentation (43.8%). Complex partial seizures (60.6%) were more common than simple partial seizures. (33.3%). EEG abnormality was observed in 80.65% of the subjects, 22% had focal EEG changes, 36(59%) children had generalized EEG changes. Death occurred in 4 cases.

CONCLUSION

Generalised seizures were more commonly identified presentation than partial seizures in preschool and school age group. Intracranial infections were the leading cause of new onset seizures. Neurocysticercosis followed by tuberculoma were the common causes for partial seizures. CT/MRI and EEG were more likely to be informative in partial seizures than in generalised seizures.

KEYWORDS

New Onset Seizures, Paediatrics, Neuroimaging.

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BACKGROUND

Seizure has been recognized since antiquity and probably as old as man himself. Convulsive disorders in children are a common paediatric problem accounting for 0.6% of hospital

admissions. The most recent estimates of the prevalence rate of recurrent convulsions in school children range from 5.2 to 7.3 per 1,000. The causes of convulsions in children are many and vary in frequency in various age groups.¹

Etiological spectrum of acute symptomatic seizures in developing countries is different from developed countries. In India, intracranial infections still constitute the single largest cause of childhood convulsions. Single small enhancing CT lesions (SSECTL) are an important cause of seizures in India. Initially it was thought that SSECTL were because of tuberculosis, focal encephalitis, microabscesses and cysticercosis but now histopathological studies suggest that in most of the cases SSECTL is because of dying cysticercus larva. So aetiology itself changes over time.¹

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The classification offered by ILAE (International League Against Epilepsy) provided a big leap in the understanding of seizures and improved communication among doctors.² The tremendous advances in neuroradiological investigations have resulted in a series of non-invasive diagnostic procedures which show various physiological and pathological changes much precisely. However it is not always that the information derived from these investigations changes the line of management in present context. Hence it is essential to evolve a method to identify children with symptomatic epilepsy by clinical criteria so that expensive investigations can be judiciously used

Aims and Objectives

- To study the aetiological factors, age, sex distribution and clinical profile of seizures for new onset seizures in children aged 3-12 years
- To assess the role of EEG and Neuroimaging in children with new onset seizures
- To know the response to treatment and follow up in children with seizures

Design

Prospective study done in the Tertiary care hospital in the Department of paediatrics

Inclusion Criteria

All Children in preschool and school age group (children aged 3-12 years) presenting with new onset seizures.

Exclusion Criteria

Children with previous history of seizures, with developmental retardation and prior neurological abnormality, children presenting with seizure mimics and children presenting with trauma and seizures were excluded

MATERIALS AND METHODS

Methodology

Children who satisfied the inclusion criteria were included in the study after getting informed written consent from the parents. The data regarding their name, age, sex, address, type of seizures (according to international classification of epileptic seizures), past history of seizures, contact with tuberculosis, drug history, development history, family history were collected in a preformed proforma. All efforts were made to investigate the cases completely wherever indicated to reach a definitive diagnosis regarding seizure type and aetiology. Cases, where data, either clinical or investigative, was inadequate were excluded from the study. History obtained from a reliable witness regarding detailed description of the episode or personal observation during hospitalization primarily formed the basis for identifying the seizure disorder. Relevant investigations like routine blood counts, chest X-ray, BCG or Mantoux, C.S.F analysis, fundus examination, EEG, and CT/MRI scan were done to confirm the clinical suspicion about the nature of the seizure disorder and its aetiology.

Routine surface EEG recordings were done on a sixteen channel machine with the child either awake or asleep depending on the co-operation. Neuroimaging was done whenever a focal lesion like tuberculoma, abscess, vascular malformation was suspected.

Anticonvulsants were chosen depending upon seizure type and frequency. When the aetiological factor demanded, a specified treatment was instituted in the form of antibiotics for pyogenic meningitis, antituberculous drugs for tuberculoma and TBM, anticerebral oedema measures for raised ICT and albendazole with steroids for cases of neurocysticercosis. Patients were followed periodically for a period for one year. During the follow up, seizure control, compliance to drugs, any side effects and response to specific therapy were checked.

Statistical Application

For numerical data requiring estimation and evaluation of parameters as age, mean and standard deviation were calculated. The difference between two or more proportions was tested using "Chi-square test". In situations where the expected cell value is less than 5, Fisher's exact test was used. P value <0.05 was considered to be significant.

RESULTS

A total of 187 children presented to the hospital with complaints of seizures. Out of these, after excluding children with developmental retardation, past history of seizures, with history of trauma, 98 children formed the study group. Out of them 65 showed generalized seizures and 33 with partial seizures.

Generalized Seizure	Partial Seizure	Total
65	33	98

Table 1. Types of Seizures

The mean age group at which generalized seizure occur was 6.8 years and that of partial seizure was 7.4 years. Majority of the children presented in the 3-5 yrs. age group (57%). In our study partial seizure occurred more frequently in children beyond five years of age (57.5%) whereas generalized seizure was almost evenly distributed throughout the study. Mean age of generalised seizures being 6.8 yrs., while that of partial seizures was 7.3 yrs.

The overall Male: Female ratio was 1.04:1. Male: Female ratio in generalized seizure group was 1.1:1. Male: Female ratio in partial seizure group was 0.94:1.

Seizure type	Family History		Total
	Present	Absent	
Generalized Seizure (N=65)	10(15.4%)	55(84.6 %)	65
Partial Seizure (n=33)	3(9.1%)	30 (90.9%)	33
Total (n=100)	13 (13.3%)	86(86.7%)	98

Table 2. Family History of Seizure

Only 13.3% of children had family history of seizure. Only 15.4% of children with generalized seizure had the family history of seizure. Only 4.1% of children with partial seizure had the family history of seizure. By applying chi square test of significance, there was no significant difference in the family history in both generalized and partial seizure groups (P = 0.321).

Aetiologies	Number (n=98)%
Intracranial Infections (Tuberculous meningitis, Pyogenic meningitis, Cerebral malaria, Viral encephalitis)	41 (42.8%)
Space Occupying Lesions (Neurocysticercosis, Tuberculoma Brain Abscess)	32 (32.65%)
Cerebrovascular Accidents	2(2.04%)
Metabolic	3(3.06%)
Others	9 (9%)
Unidentifiable	11(11.22%)
Total	98(100%)

Table 3. Distribution of Aetiologies in Patients with Seizures

Intracranial Infections including granulomata were found to be leading cause of childhood convulsions (73/98). Neurotuberculosis (T.B. meningitis/Tuberculoma) still occupied the top chair with incidence of (26/73). This was followed by neurocysticercosis including calcification (20), pyogenic meningitis (12), cerebral malaria (8), viral encephalitis (7).

2% of seizures were caused by cerebrovascular accidents, among which infarcts constitute one case and cerebral venous thrombosis one case. Hypertensive encephalopathy accounted for 2 cases and poisoning accounted for one case

Neurocysticercosis (NCC)	Number
SSECTL	15
MREL	4
Calcification	1

Table 4. Various Types of Neurocysticercosis in Patients with Seizures

20% seizures were caused by neurocysticercosis out of which 15 cases were caused by solitary cysticercus granuloma (75%), 4 cases by multiple ring enhancing cysticercus lesions (20%) and calcification in 1 case (5%)

CNS Tuberculosis	Number (n=26)	% among CNS Tuberculosis
Meningitis	14	53.8
Tuberculoma	12	46.1

Table 5. Various Types of CNS Tuberculosis in Patients with Seizures

26.5% of seizures were because of CNS Tuberculosis. Meningitis accounted for 53.8% followed by Tuberculoma 46.1%.

Meningitis	Number (n=32)	% among Meningitis
Tuberculous	14	43.75%
Bacterial	12	37.5%
Viral	7	21.8%

Table 6. Various types of Meningitis in Patients with Seizures

Meningitis accounted for 32% (n=32) of seizures. Tuberculous meningitis was the most common meningitis (n=14, 43.75%), followed by bacterial meningitis.

Aetiologies	3-5 yrs.	6-12 yrs.	Total
Intracranial Infections	25	16	41
Tuberculous meningitis	9	5	14
Pyogenic meningitis	8	4	12
Cerebral malaria	4	4	8
Viral encephalitis	4	3	7
Space Occupying Lesions	10	22	32
Neurocysticercosis	6	13	19
Tuberculoma	4	8	12
Brain Abscess	0	1	1
Cerebrovascular Accidents	1	1	2
Infarct	0	1	1
Cerebral venous thrombosis	1	0	1
Metabolic	2	1	3
Poisoning	1	0	1
Hypertensive encephalopathy	1	1	2
Calcification	1	0	1
Febrile Seizures	3	0	3
Epileptic	3	2	5
Unidentifiable	6	5	11
Total	51	47	98

Table 7. Aetiology of Seizures as per Age Group

Intracranial infections made 49% of seizures in preschool age group while they made 34% in school age group. Space occupying lesions made 19.6% CNS infections in preschool age group while they made 46.8% in school age group.

Cerebrovascular accidents constitute 2% in each age group. Hypertensive encephalopathy constitute 2% in each group. Febrile seizures account for 6% of preschool age group seizures.

Incidence of epilepsy was 6% in preschool children while 4.2% in school age group.

Aetiologies	GTCS	GTS	SE	SPS	CPS
Intracranial Infections					
Tuberculous meningitis	7	3	2	0	2
Pyogenic meningitis	6	3	1	0	2
Cerebral malaria	4	2	1	0	1
Viral encephalitis	3	1	1	0	2
Space Occupying Lesions					
Neurocysticercosis	5	2	0	7	5
Tuberculoma	3	2	0	3	4
Brain Abscess	1	0	0	0	0
Cerebrovascular Accidents					
Infarct	0	0	0	0	1
Cerebral venous thrombosis	1	0	0	0	0
Metabolic					
Poisoning	1	0	0	0	0
Hypertensive encephalopathy	0	1	0	0	1
Calcification	1	0	0	0	0
Febrile seizures	3	0	0	0	0
Epileptic	1	0	1	1	2
Unidentifiable	7	3	0	1	0
Total	43	17	6	12	20

Table 8. Seizure Presentation in Relation to Aetiology

Generalised tonic clonic seizures were the most common presentation (43.8%). Complex partial seizures (60.6%) were more common than simple partial seizures. (33.3%), 6% of seizures presented as status epilepticus among which intracranial infections were the cause for 5 cases while one case was Epilepsia partialis continua.

Intracranial infections were more likely to present as generalised seizures (83%) whereas space occupying lesions were more likely to present as partial seizures (58%).

Abnormalities	3-5 yrs.	6-12 yrs.	Total
Neurocysticercosis	6	13	19
Tuberculoma	4	8	12
Abscess	0	1	1.
Vascular	2	2	4
Hydrocephalus(post meningitis)	1	-	1
Cerebral oedema	1	1	2
Calcification	1	-	1
Total	15	25	40

Table 9. Neuroimaging Findings

On neuroimaging, NCC was a major finding {47.5%} followed by tuberculoma 30%. Abscess, hydrocephalus, calcification make 2.5% each. Cerebral oedema 5%. Vascular events make 10%.

Electroencephalogram Findings

Among 98 children included in the study, EEG was done in 61 children. 49(80.65%), had EEG abnormality. 31(80%) children with generalized seizure had EEG abnormality and 18(81.8%) children with partial seizure had EEG abnormality. Applying chi square test of significance, there was no statistically significant difference in the incidence of EEG abnormality between generalized and partial seizure groups of children

Seizure Type	Normal EEG	Generalized EEG Changes	Focal EEG Changes	Total
Generalized	8(20%)	26(67%)	5(13%)	39
Partial	4(18.2%)	10(45.5%)	8(36.4%)	22
Total	12(19.7%)	36(59%)	13(22%)	61

Table 10. Electroencephalogram Findings

Among 98 children included in the study, 13(22%) had focal EEG changes, 36(59%) children had generalized EEG changes. There was significantly high incidence of focal EEG changes in partial seizure group compared to generalized seizure group

Outcome of Patients with Seizures

Death occurred in 4 cases. All the 4 cases were due to intracranial infections.

Type of Deficit	No. of Patients	Aetiology
Hemiplegia	1	Tuberculous meningitis
Ophthalmoplegia	1	Tuberculous meningitis
Facial palsy	1	Tuberculous meningitis
Monoplegia	1	Tuberculous meningitis
Hemiplegia and facial palsy	1	Infarct

Table 11. Neurological Deficits at Discharge

4 cases of TBM case, one case of infarct had residual neurological deficits during discharge. Out of 5 case, one cases had hemiplegia, one case had ophthalmoplegia, one case had monoplegia, one case had facial palsy, 1 case had both hemiplegia and facial palsy. Physiotherapy was advised to them in addition to the routine treatment.

All cases were advised for follow up for atleast 1 year. 48 patients came for follow up but 46 case lost follow up. During follow up recurrence was observed in two cases of neurocysticercosis, one case of tuberculous meningitis, one case of temporal lobe epilepsy, one case of febrile seizure.

Case with residual palsy in form of Ophthalmoplegia and isolated facial palsy were completely resolved during follow up while those cases with hemiplegia and monoplegia had variable recovery of motor power in paralysed muscles.

DISCUSSION

Seizures are common disorders in children found all over the world. Presently CNS infections like malaria, meningitis, tuberculosis, HIV, neurocysticercosis account for significant number of cases in developing countries. Since these infections vary from region to region aetiology of seizure may also vary from region to region.¹ It is important to identify the cause wherever feasible so that appropriate treatment is instituted at the earliest.

Partial seizures were more common in school age group (57.5%) than preschool age group (43.1%). When compared within each age group, generalised seizures were more common than partial seizures. In study made by Simi Misra et al,³ generalised seizures were more common.

The mean age of generalized seizure in our study was 6 years 8 months and mean age of children with partial seizure was 7 years 4 months. The difference in this two groups was not statistically significant. Zajac A et al⁴ and Ramesh Baheti et al⁵ also observed no statistical significance in distribution of seizures.

No statistically significant difference between male to female ratio was observed in our study. In study made by Ramesh Baheti et al,⁵ there was no statistical significance in sex distribution of seizures.

Family history was present in 14% of children. Redda Tekle - Haimanot et al⁶ observed positive family history in 22%.

Of the 98 children studied, 65(66.3%) of children presented with generalized seizures and 33 (33.7%) of children presented with partial seizures. In our study simple partial seizures constituted 12.2% of seizures while complex partial seizures constituted 20.4%. According to study made by Shankar P Saha et al⁷ Simple partial seizures constituted 10.5% total seizures, Complex partial constituted 21.1% of total seizures.

In the present study CNS infections top the list, constituting 74.4% of aetiologies. Out of these, tuberculosis made a major part, Tuberculomas and tuberculous meningitis together constituted 26.5%. In 20.4% cases Neurocysticercosis was made out which constitutes another major cause. Other causes were pyogenic meningitis, cerebral malaria, viral meningoencephalitis. Intracranial infections were more common in preschool age group (49%) compared to school age group (34%). Granulomas including neurocysticercosis and tuberculomas were more common in school age group.

In the present study only 3 cases of febrile seizures occurred in age group of 3-12 yrs., indicating the rarity of presentation of simple febrile seizures for first time beyond 3 yrs of age though they can occur upto 5 yrs. one case manifested atypical febrile convulsions.

In our study, incidence of epilepsy was 5%. Benign Rolandic epilepsy was seen in one child, Benign partial epilepsy with affective symptoms was seen in one child. We observed one case of epilepsia partialis continua in our study. The EEG was diagnostic in the above cases.

In a study made by K K Locham et al,⁸ meningitis made 40% of aetiologies and neurocysticercosis made 22% of

aetiologies. In our study meningitis accounted for 42.8% of aetiology while neurocysticercosis was 19.4% of aetiology which is closely correlating. Infarcts made 12% of seizures in the above mentioned study while in our study infarcts made 4%. Out of 4%, 2% infarcts were caused by tuberculous meningitis.

In our study, neurocysticercosis was more common in school age group (67%) than preschool age group (33%). In a study made by K K Locham et al⁸ on neurocysticercosis, 20% of cases occurred below 5 yrs. and 80% above 5 yrs. Neurocysticercosis presents as partial seizures rather than generalised seizures in school age group. Neurocysticercosis presentation was generalised seizures in 40% cases and partial seizures in 60%. Out of this, complex partial seizures made 25%. Out of all cases of Neurocysticercosis, 75% were solitary cysticercus granuloma, 20% as multiple ring enhancing lesions, 5% calcification.

In a study made by JMK MURTHY et al⁹ neurocysticercosis accounted 16% of aetiologies whereas in our study it accounted for 20% of aetiologies. In a study made by Rajashekar et al¹⁰ solitary cysticercus granulomas made 60-70% of neurocysticercosis. Partial seizures made 70% of solitary cysticercus granulomas. Breakthrough seizures during treatment occurred in 14.5% cases. In our study, tuberculomas had 42% as Generalised seizures, 58% as partial seizures. In a study by Ushakanth Mishra et al¹¹ tuberculomas had generalized seizure presentation in 62% cases while as partial seizures in 38% cases.

Neuroimaging

In our study 65% of partial seizures had positive findings in CT/MRI and 35% in generalised seizures. Children with partial convulsive seizures were more likely to have abnormal neuroimaging findings than patients with generalized convulsive seizures. Similar observation was made in previous studies.¹² Our study neurocysticercosis was observed as the commonest abnormality in partial seizure group, followed by tuberculoma. In a study made at Institute of Child Health and Hospital for children, department of neurology, Chennai with reference to focal seizures of recent onset and CT scan, CT was helpful in revealing aetiology in 72.6% cases. The commonest abnormality was ring enhancing lesion (48.76%) followed by calcification (8.2%), infarct (6.17%) glioma (1.9%) abscess (0.6%) haemorrhage (0.6%). The results correlated with regard to infarct and ring enhancing lesions.

Ring enhancing lesion is the commonest abnormality observed in many studies. In our study ring enhancing lesions made 77.5% of CT lesions. There is statistically significant difference in the occurrence of Neuroimaging abnormality in partial seizure than generalized seizure groups in our study. Annie T Berg et al¹³ in their study observed statistically significant difference in CT lesions between partial and generalised group.

A study from North India by Garg et al on 1, 023 patients with simple partial seizures documented a single enhancing CT lesions in about 50% of patients.¹⁴ In a study by Ushakanth Mishra et al,¹¹ out of 136 patients with

tuberculous meningitis, 63 had abnormal CTs i.e. 46%. In our study, 28.5% of cases had positive findings in tuberculous meningitis cases.

In our study, on neuroimaging, 65% had lesions in parietal lobe, 15% in frontal lobe, 2.5% in occipital lobe, 2.5% in temporal lobe, 2.5% in parietotemporal region area, 2.5% in cerebellar region, 5% in frontoparietal area and 7.5% diffuse lesions.

In the study done by Rajashekar et al,¹⁰ parietal lobe was the commonest followed by frontal, temporal, occipital lobes.

EEG

Overall electroencephalogram findings were abnormal in 80.65% of cases who underwent EEG. 80 % had abnormal electroencephalogram findings in generalized seizures and 81.8% in partial seizure group in our study. Ramesh Baheti et al⁵ observed 76.9% of children had abnormal EEG in generalized seizure group and 73.0% of children had abnormal EEG in partial seizure group. Kurupath Radhakrishnan et al¹⁵ observed EEG abnormality in 83.6% of children studied and were generalized in 74% of children. There is high incidence of EEG abnormality in partial seizure group. This observation is comparable to study done by Zajac et al.⁴ 13% of children with generalized seizure had focal EEG abnormalities in our study. This finding may be due to focal onset seizure with fast secondary generalization.

Treatment and Outcome

All case of meningitis were treated with appropriate antibiotics. There was no need for use of long term antibiotics in pyogenic meningitis, cerebral malaria and viral meningoencephalitis except for the duration of acute CNS insult. However in tuberculous meningitis cases with positive neuroimaging findings or abnormal EEG were kept on AEDs during discharge. There was no seizure recurrence.

Anti-tuberculous drugs were given for tuberculoma along with steroids. Recurrence was observed in one case of meningitis.

All cases of solitary cysticercus granuloma group were kept on anti-epileptic drugs and steroids and were followed at 3 months. 2 cases had break through seizures during treatment this is closely correlating with the observation made by Rajashekar et al.¹⁰

Epileptic patients were kept on AEDs. There was no seizure recurrence after AEDs in benign partial epilepsy and epilepsia partialis continua. But child with temporal lobe epilepsy had no remission and needed add on of phenobarbitone along with phenytoin.

Risk Factors associated with seizures during acute phase of illness included disturbed consciousness on admission, abnormal neuroimaging findings, and low glucose and high protein concentration in the cerebrospinal fluid (Chang et al).¹⁶

According to Shinnar S, Berg AT,¹³ the cumulative risk of seizure recurrence for a first unprovoked seizure was 26% at 12 months, 36% at 24 months, 40% at 36 months, and 42% at 48 months. The cumulative risk of recurrence with a

remote symptomatic first seizure was 37%, 53%, and 60% at 12, 24, and 36 months, respectively, compared with a cumulative risk of 24%, 33%, and 36% at 12, 24, and 36 months, respectively, in the children who had had an idiopathic first seizure. A history of epilepsy in a first-degree relative was a significant risk factor only in idiopathic cases with abnormal electroencephalograms.

CONCLUSION

Generalised seizures were more common presentation than partial seizures in preschool and school age group. Intracranial infections were the leading cause of new onset seizures in preschool and school age group. In partial seizures neurocysticercosis was a common cause followed by tuberculoma.

CT/MRI and EEG were more likely to be informative in partial seizures than in generalised seizures. With appropriate investigations, cause was more likely to get identified in partial seizures. Patients with partial seizures who showed focal changes in EEG were more likely to show abnormalities on neuroimaging. Most of seizures can be controlled by monotherapy with appropriate antiepileptic drugs.

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