Original Research Article

# Role Of Radio Imaging (CT and MRI) In Children With First Episode Of Apparent Unprovoked Generalized Seizure

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## Abstract

**Introduction**:Approximately 10% of population will have at least one seizure in their lifetime at some point of time. Half of these will occur during childhood and adolescence with highest risk before one year. Some patients with a first seizure eventually go on to have additional seizures and be diagnosed with epilepsy. Thus the occurrence of a single seizure in childhood deserves careful consideration. **Aims and objectives:** To determine the percentage of children presenting with first episode of an apparent unproved generalized seizure and role of CT and MRI. **Materials and Methods:** Children between the age groups of 6 months to 12 years presenting to the O.P.D and Emergency department of Pediatric Medicine, PMCH, Patna , Bihar from March 2018 to February 2019. **Results:** In our study among all unprovoked generalized seizures in childhood- idiopathic variety is the commonest group 88.13%(N=52) out of total 59 cases. Among all unprovoked generalized seizures generalized tonic clonic is the major group 69.49%(N=41). **Conclusion:** The incidence of radioimaging abnormality in first episode of unprovoked generalized seizure is significant ( 11.86%). Majority of lesions being granuloma -either tuberculoma or cysticercosis.

**Keywords**: CT, MRI, Seizures



## Introduction

Approximately 10% of population will have at least one seizure in their lifetime at some point of time. Half of these will occur during childhood and adolescence with highest risk before one year. Some patients with a first seizure eventually go on to have additional seizures and be diagnosed with epilepsy. Thus the occurrence of a single seizure in childhood deserves careful consideration.[1]Firstly a distinction should be made between provoked and unprovoked seizure since this has implication for treatment and prognosis, such as the risk of developing epilepsy. As per ILEA (International league against epilepsy) seizure is classified based on clinical features and EEG findings are Partial and Generalised. [2]A partial (focal) seizure is one that involves a small region of the brain. A simple partial seizure occurs with intact awareness of self and surroundings. The simple partial seizure will often evolve to a complex partial or tonic-clonic seizure. A simple partial seizure is usually confined to a single lobe of one cerebral hemisphere. The seizure focus is the cortical area where the seizure begins. [3] A complex partial seizure is a partial seizure that occurs with impaired awareness of self and surrounding.The person may not have communication wito others, does not follow commands,does not retain memory of events during the seizure. Purposeless repetitive motor activity (automatisms) might occur. Oral automatisms include lip smacking and swallowing. Gestural automatisms include fumbling, picking and rubbing. A complex partial seizure often involves bilateral limbic cerebral areas (Gloor, 1986). Unlike a simple partial seizure, a brief period of confusion may follow a complex partial seizure.[4]Absence seizure is a generalized seizure distinguished by a generalized spike and wave EEG pattern. The absence seizure consists of a brief period (e.g. 10 seconds) of impaired responsiveness, stare, arrest of ongoing activity, a change in facial appearance and an immediate return to normal without a post –ictal stage. Automatisms might occur.[5]A myoclonic seizure consists of brief body jerks. Limb movement or a startle will sometimes elicit these jerks. Unlike clonic seizure, the jerks of myoclonic seizures occur at irregular times. A tonic seizure occurs with the rapid onset of a rigid posture with head flexed forwards, elevation of both arms, and flexion of the trunk forwards at the thigh. If standing, the person often falls. A atonic seizure consists of a brief lapse of muscle tone. Atonic seizure are rare, epileptic drop attacks are usually due to myoclonic or tonic seizures . A lapse in muscle tone can occur during a atypical absence seizure.[6]Seizures induced by isoniazid respond to intravenous pyridoxine. Acute changes in electrolytes or osmolarity are more likely to cause a seizure. Acute liver failure might cause seizures because of hypoglycemia. Hypoparathyroidism might cause seizures because of hypocalcemia. Hypomagnesemia usually occurs with hypocalcemia; it is uncertain how much the hypomagnesemia contributes to seizures in this section.[7]The role of neuroimaging following first episode of partial seizure is already an established fact but it's role in generalized seizure is still a debatable point. The occurance of an unprovoked seizure may suggest the possibility of an underlying neuroradiological structural abnormality – particularly in this era of newer imaging modalities like MRI in different sequences and functional imaging like PET (Positron emission tomography), SISCOM (Subtraction ictal SPECT coregistered to MRI) & MRI spectroscopy.in the form of SPECT (Sjngle photon emission computed tomography),

**Aims and objectives**

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1. To determine the percentage of children presenting with first episode of an apparent unproved generalized seizure having some neurological abnormalities in the brain.
2. Utility of neuroimaging (CT or MRI) in evaluation of children with first episode of an apparent unprovoked generalized seizure.

**Materials and Methods**

Children between the age groups of 6 months to 12 years presenting to the O.P.D and Emergency department of Pediatric Medicine, PMCH, Patna , Bihar from March 2018 to February 2019.Patients who fit into generalized seizure disorder as per International League Against Epilepsy (ILEA) classification of Epileptic seizures was considered fit for the study. Myoclonic jerks, infantile spasms and Focal seizures with secondary generalization are excluded from the study.History from parents and caregivers was taken into account in. the study.History is the most important thing in the present study as incidence has already taken place by the time the patient reports to a doctor.Detailed history of the incident –how it took place whether focal or generalized in onset- what was the associated features ,whether any provocative factor was present For vivid information of the incident the parents and caregivers were asked to act out the incident. History of similar episode in the family is enquired into. Thorough physical examinations, neurological examination with EEG evaluation of patients along with detailed history of developmental milestones, socio-economic and particul-arly contact H/O. Tuberculosis was enquired into. History of residence , occupation, annual income of the gurdian was also taken while history taking.Selected patients fit for study group were advised to undergo MRI study of brain. Those who could not afford MRI were advised to undergo CT SCAN of brain. Contrast was used as and when necessary.

**Results**

In our study among all unprovoked generalized seizures in childh-ood-idiopathic variety is the commonest group 88.13%(N=52) out of total 59 cases. Among all unprovoked generalized seizures generalized tonic clonic is the major group 69.49%(N=41). Allthough patients with intracranial structural lesions mostly present with focal seizure some of them may present with generalized seizures – this is as per study of singhi PD, Baranwal AK in October 2001. In our study structural lesions among generalized seizures was 11.86%.There is significant sex distribution of seizures noted in our study as male : female ratio has been found to be 1.8:1. This corresponds to study of Eriksson and Koivikko in 1977.As per our study Age group of 1 to 5 years are the most vulnerable group in unprovoked generalized seizure-44.06%(N=27) out of total 59 cases This is in keeping with the fact of Nelson's Text book of Pediatrics. Rural and urban population group show no difference in seizure incidence – in terms of first episode of generalized seizures.Difference lies with western population in terms of type of Intracranial structural lesion focal or generalized cortical atrophy, tumors, A-V malformation etc. are more common lesion in western population where as Granuloma, A-Vmalformation, tumor are the most predominant finding in India. Single ring enhancing lesion (SREL) is the commonest finding – this corroborates with study of Wadia et el and Hussain Jageer's study.Also study corroborates with Trentin AP,Teive HA in June 2002 where calcification/ cysticercosis and neurocysticercosis/cysts has been found as the most predominant lesion (23.6%).No difference in terms of incidence of Intracranial structural lesions is present between rural and urban population but difference lies in terms of type of lesion as – Granuloma is the most common lesion found in rural population of India. Tuberculoma has been incrimated as the most common finding in present study which corroborates with Hussain Jageer's study on Indian population.Among Granuloma two lesion were unidentifiable – where either neurocysticercosis or Tuberculoma could be the finding. For definitive diagnosis biopsy from lesion is indicated.

**Table 1:CT / MRI findings in first episode of generlized seizue**
**Total Seizures Cases -59**

| Radio- Imaging Findings | Abnormality Detected | Percentage |
|---|---|---|
| Abnormal CT/ MRI | 7 | 11.86% |
| Normal CT/MRI | 52 | 88.13% |

**Table 2:Distribution of radiological abnormality detected in first episode of apparently unprovked generalized seizure**

| Structural Lesions | Present | Percentage |
|---|---|---|
| Granuloma | 5 | 71.42% |
| A-V Malformation | 1 | 14.28% |
| Tumors | 1 | 14.28% |

**Discussion**

The role of radioimaging in partial seizures in children has already been an established fact but its role in children with generalized seizures particularly in unprovoked seizure is still a debatable point. Several studies have been done regarding role of radioimaging in seizure disorder. Most of the studies have been done in general population without discriminating between provoked and unprovoked seizures,symptomatic and asymptomatic seizures, idiopathic and cryptogenic seizures.[8]In the present studies of 59 cases of unprovoked generalized seizure 11.86% (n=7) had abnormal radio-imaging studies – whereas 88.13% (n=52) had normal findings. In a study by Trentin AP, Teive HA, Tsubouchi MH, de Paola L, Minguetti G. on June 2000 who found 48.8% of idiopathic generalized seizures and 51.2% abnormal studies. However this study was done in a mixed population of age group 0 to 40 years and both provoked and unprovoked groups were taken into account. So the study result might have been increased.[9]In most Indian studies primary generalized seizures were the predominant type accounting to 45% to 88% of cases.That idiopathic generalized seizure is the most prevalent group among Indian child has been described in Nelson's text book of pediatrics.[10] In western study by R.A. Schoenenberglu, S.M. Hein, in October 15 – 1994 – 40 patients (34% 95% confidence interval 25% to 42%) had intra cranial structural lesion in uncomplicated 1st generalized seizure in adult population. This study result is quite higher in comparison to ours.This is because the Schoenenberglu's study was performed in adult population and also both provoked and unprovoked group were taken. So the study result was higher. [11]However this study was performed in emergency department with new onset seizures and both provoked and unprovoked groups were taken and also all types of seizures including partial seizures were taken into account.So the study result was higher in comparison to our study. Of the 59 cases of generalized seizure – 41 had generalized tonic-clonic seizure which is the maximum group. Generalized tonic-clonic seizure among generalized seizure is the commonest group as per Nelson's text book of paediatrics.The present study is in keeping with previous studies as most generalized seizure were of idiopathic varieties. Radiological abnormalities were particularly positive in those cases where focal neurological abnormality or prolonged neurological deficit following the seizure episode was evident or abnormal EEG was present. While evaluating age of first seizure occurrence the most vulnerable age at first seizure were > 1 –5 years. Out of 59

children with seizures 27 children (44.06%) had their first seizure at this age group, only 4 (6.77%) were more than 10 years old. This corroborates with the current knowledge that idiopathic generalized epilepsy is more prevalent among this age group.[12]In the present study there is a strong male preponderance, the boys : girls ratio is 1.8:1 -- this corroborates with the study by Eriksson and Koivikko in 1977, published in the journal Epilepsia, where the incidence varied markedly with age, with a higher ratio in case of boys. [9]In the current study granuloma is the most common findings among the seizure patients. Among the lesions granuloma constituted 71.42% (n=5), A-V malformation 14.28% (n=1) and tumors 14.28% (n=1). This is quite different from the study result in western countries.In the study by shinnar S, O'Dell the most common abnormalities were focal encephalomalocia (n=16) and cerebral dysgenesis (n=11) and cerebral migration abnormality (n=6).[10]It is also important to note that a significant number of children with tuberculoma had evidence of other organ involvement. In these cases chest xray, mantoux and peripheral blood smear have been analyzed to come to conclusion. Neurocysticercosis :Criteria of Del – Brutto – et al. That predominant SREL in Indian subcontinent are tubercular in origin corresponds to study made by Hussain Jageer, Srinivasan S, Serane V Tiroum-ourougane Mahadevevan S, Elangovan S, Bhuvaneshwari V in year 2004 – published in IAP Journal.[11]Single ring enhancing lesion (SREL) in the predominant finding in our study, 60% (n=3), multiple ring enhancing lesion (MREL) and multiple calcified lesions (MCL) each constituting only one each out of total 5 cases of ring enhancing lesion.This corroborates with the study by Singhi PD, Barawal AK in October 2001–where single, small enhancing computed tomography lesion in Indian children presenting with focal or at times generalized seizures is evident. Here neurocysticercosis has been implicated as the predominant findings – criteria for confirmation was visualization of scolex on MRI was undertaken. [12]In the study by Trentin AP, Teivett A, in 2002 June – calcification or cysticercosis was evident in 14%, neurocysticercosis / cysts (9.6%) was the predominant findings in generlized seizure. This study result is much higher in comparison to present study.[11]In the present study of granuloma two patient who were not definitely diagnosed as cysticercosis or tuberculoma the diagnosis remains undetermined. Many of these could be either neurocysti-cercosis or tuberculoma or some other unidentifiable pathology. As these constitute a major percentage (40%) of all granulomas identified one can not be certain of the percentage of either infection in this study. There is a need for histological diagnosis of the brain lesion before a definitive comment can be made on the varying etiology of the ring enhancing lesion in different parts of the country.[7]Out of total 5 cases of significant percentage of radio-imaging abnormalities – percentage among rural population group is 57.3% (n=4) in comparison to urban population where the percentage is 42.85 (n=3) which is insignificant. This is in keeping with the most studies as TB and neurocysticercosis which constitute major percentage of granuloma is quite common among rural population of a developing country like India where unhygienic and poor socioeconomic condition prevail which are deemed to be the fore-runner of above conditions.[12]In the study it was also evident that most of the granulomas were supratentorial in location. Out of total 5 cases of granuloma 75% (n=5) located in supratentorial region –25%(n=1) located in infratentorial location. Among the supratentorial lesions – 2 was in parietal lobe, 1 in occipital lobe and 1 in temporal lobe. The single infratentorial granuloma was located in cerebellum.[11]

**Conclusion**

The incidence of radioimaging abnormality in first episode of unprovoked generalized seizure is significant ( 11.86%). Majority of lesions being granuloma -either tuberculoma or cysticercosis.

**Conflict of Interest: Nil**
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**References**

1. Cowan L, Bodeasteiner J, Leviton A, Doherty L. Prevalence of epilepsies in children and adolescent. Epilepsia 1989; 30 : 94 – 106.
2. Alving J. Clssification of epilepsies : an investigation of 402 children. Acta Neurol Scand 1979; 60 : 157 – 163.
3. Al- Sulaiman AA, Ismail HM. Clinical pattern of newly diagnosed seizures in Saudi Arabia : a prospective study of 263 children. Childs Nerv Syst 1999; 15 : 468 – 471.
4. Fritsch G, Ebner F, SchneiderG. Computed tomography in partial epilepsies in children. Eur Neurol 1988; 28 : 306 – 310.
5. Kapoor M, Talukdar B, Chowdhuy V, Puri V, Rath B. Intracranial structural lesions in young epileptics : A Computed Tomographic Study 1997; 35 : 537 – 541.
6. Rajshekhar V,Haran RP, Prakash GS,Chandy MJ. Differe-ntiating solitary small cysticercus granulomas and tuberclomas in patients with epilepsy. Clinical and computerized tomo-graphic criteria. J Neurosurg 1993;78 :402 – 407.
7. Del Brutto UH, Rajasekhar V, White Jr AC et el. Proposed diagnostic criteria for neurocysticercosis. Neurology 2001; 57 : 177 – 183.
8. Kwong KL, Chak WK, Wong SN, So KT. Epidemiology of children epilepsy in a cohort of 309 Chinese children. Pediatr Neurol 2001; 24: 276 – 282.
9. Commission on classification and Terminology of the International League Against Epolepsy. Proposal for Revised classification of the epilepsies and epileptic syndromes. Epilepsia 1989; 30: 389 – 399.
10. Mortor LD, Pellock JM. Diagnosis and treatment of epilepsy in children and adolescents. Drugs 1996; 51: 399 – 414.
11. Singhi S, Singhi PD, Walia BNS. Clinical profile and etiology of partial seizures in Chandigrah children. Epilepsia 1990; 31S: 666 – 667.
12. Bajaj S, Barthwal SP, Dwivedi NC, Masheshawri AK, Goel UC. Contrast computed tomography in epilepsy with special reference to intracranial ring or disc enhancing lesions. J Assoc Physicians India 1991; 39: 543 – 545.