Abstract

Background: To evaluate the role of EEG and Magnetic resonance imaging (MRI) in first episode of unprovoked afebrile seizure in a child.

Subjects and Methods: Data was collected retrospectively from case records of patients admitted with seizures during the period between January 2016 to December 2018. All children with first episode of unprovoked afebrile seizure (1-15 years of age) were included in the study.

Results: Case records of 108 patients with first episode of unprovoked afebrile seizures were reviewed. Out of these, 65 patients were investigated with MRI and EEG. 54 children (83.1%) had generalized tonic clonic seizures (GTCS), 11 had partial seizures (16.9%). EEG abnormalities were seen in 21 children, predominantly in GTCS type. The most common EEG abnormality observed was sharp and spike wave discharges. 7 children (10.7%) had abnormal MRI. The accuracy of MRI detecting the abnormality when EEG was abnormal was 33.3% (p < 0.05).

Conclusion: This study illustrates that routine neuroimaging for all children with first episode of unprovoked afebrile seizures is gratuitous. Neuroimaging can be reserved for those patients with recurrence of seizures or those children with clinical findings suggestive of intracranial pathologies.

Keywords: Seizures, EEG, Afebrile, MRI, First episode.
**Exclusion criteria:**
Children < 1 year of age, children previously diagnosed with a seizure disorder/ cerebral palsy / neurological illness, biochemical abnormalities/ head trauma causing seizure were excluded.

Demographic data, detailed history with special regard to type and duration of seizures, significant family history, complete examination including developmental assessment and neurological examination findings were noted.

EEG reports were interpreted by an experienced consultant neurologist and neuroimaging reports were analysed by a single radiologist to eliminate inter observer variation.

Data was analysed using SPSS software version 17.0. A P value <0.05 was considered as statistically significant.

The 2017 International League against Epilepsy (ILAE) Classification (Revised) of seizure types was used to classify seizures.89

**Results**

<table>
<thead>
<tr>
<th>Table 1: Demographic data of study subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic data</td>
</tr>
<tr>
<td>Age group</td>
</tr>
<tr>
<td>1-5 YRS</td>
</tr>
<tr>
<td>5-18 YRS</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>MALE</td>
</tr>
<tr>
<td>FEMALE</td>
</tr>
</tbody>
</table>

256 children were admitted with seizures to our hospital during the study period, of which 108 children had first episode of unprovoked afebrile seizures. 43 children were excluded from the study due to non-availability of EEG and MRI reports. Rest of the 65 children in whom EEG and MRI was done were included in the study. Of the children included in the study 28 were females and 37 were males. 40 children were in the age group of 1-5 years. 54 children (83.1 %) had GTCS and 11 (16.9 %) had partial seizures, predominantly seen in children less than 5 years of age. [Table 1]

**EEG findings:**
EEG abnormalities were seen in 21 out of 65 (32%) children whereas 44 children had normal EEG. Children with GTCS had significantly higher incidence of EEG abnormalities when compared to children with partial seizures. The most common EEG abnormality observed was sharp and spike wave discharge. [Table 2 & 3]

**MRI findings:**
MRI was normal in 89 % (58) children and abnormal in 10.7 % (7) children. MRI abnormalities were significantly (p< 0.01) higher in children with partial seizures (6.15%) compared to children with GTCS. The MRI findings have been depicted in [Table 4].

**Discussion**
Seizures are one of the most common neurological problems in children. The first episode of seizure is always an anxiety-causing event for parents and it is the health professional’s duty to know the best approach and recommendations to use in each case.
In our study we intended to analyse the correlation between a first episode of unprovoked afebrile seizure and the
occurrence of significant EEG as well as neuroimaging findings. First unprovoked seizure (FUS) is defined as first non-febrile seizure that cannot be explained by an immediate, obvious precipitating cause such as head trauma or intracranial infection. EEG is a noninvasive, readily available and inexpensive investigation tool, helps in diagnosis of the event, identification of a specific syndrome, and prediction of long-term outcome. It also helps to differentiate a seizure from other events and predicts the risk for recurrence. American EEG society recommends EEG to be performed after all first non-febrile seizures. However optimal timing for obtaining EEG is not clear, EEG done within 24 hours of the seizure is most likely to show background and epileptiform abnormalities. EEGs performed for new-onset seizures show epileptiform discharge in approximately 18% to 56% of children. In our study, we found that 32.3% of children had EEG abnormalities. However in a study done by Doescher et al EEG abnormality was observed in 65.7% of children, a comparatively lower incidence of EEG abnormality noted in our study could be probably due to variable timings and method of EEG recording. Also, sometimes in remote and deep epileptic focus EEG can be normal. In our study overall 71% patients with generalized seizures had EEG abnormalities which was consistent with similar observations made by Al-Sulaiman et al. and Doose et al. in cases of newly diagnosed seizure. On analyzing individual abnormalities in EEG, it was observed that the most common abnormality detected was sharp wave and spikes (either alone or both) as observed by studies conducted by Baheti et al. and Doose et al. However, Shinnar et al. and Doescher et al. observed a focal slowing as most common EEG abnormality which had predominantly the children with partial seizures. Neuroimaging can also be useful adjunctive tool in evaluation of a first episode of afebrile seizure but its role in paediatric patients with first episode of unprovoked seizure is still a controversy. MRI is more sensitive than CT and is the modality of choice when indicated. Meta analytic studies done have shown that neuroimaging abnormalities are found in 30% of children but clinically significant changes were seen in 13%, however it doesn’t influence treatment or management decisions on hospitalization. American academy of neurology recommends emergent neuroimaging only in children who have post ictal focal deficits not resolving quickly and children not returning to baseline within several hours after the seizure. Emergency neuroimaging should be performed in a child with first afebrile seizure to look for intracranial pathologies needing immediate intervention. Non urgent imaging studies with MRI should be considered in child with significant cognitive or motor impairment, focal seizures, unexplained neurological examination, age less than 1 year and EEG that doesn’t show benign partial epilepsy or generalized epilepsy of childhood. In our study, MRI abnormalities was seen in 7 (10.7%) children which was consistent with the study done by Sharma et al. where they found that overall incidence of neuroimaging abnormality was 8% (26% in high risk children and 2% in low risk) emphasizing the need of neuroimaging in only high risk category like presence of predisposing conditions and focal seizures in less than 3 years, whereas well appearing and low risk children don’t warrant immediate neuroimaging. However, in various studies with children evaluated for first episode of unprovoked seizures prevalence of abnormalities in the neuroimaging ranged from 0-21% probably due to inclusion of non significant MRI findings as well. Limitations of our study were small sample size, as it was retrospective study casual relationship between investigation findings and clinical condition of the patient couldn’t be obtained, further studies are needed to establish the role of neuroimaging in Paediatric age group. Conclusion: EEG is a highly useful tool in evaluating all children with first episode of unprovoked seizure. However neuroimaging with MRI is not routinely indicated in all well appearing children with afebrile seizures and should be reserved only for high risk category. Acknowledgment: We thank all those who have helped to make this research possible, especially the children, the parents, and the families. Special thanks to Dr.Sahana ,Dr.Poorvi and Dr.Shrishail for their invaluable support .We also thank the Staff of department of paediatrics , A J Institute of medical sciences, Mangalore who were involved in the care of these children. References

10. Guidelines for Diagnosis and Management of Childhood Epilepsy Expert committee on pediatric epilepsy, Indian paediatrics, volume 46, August 17, 2000
11. Jaya Shankar Kaushik, Rajni Farmania: Electroencephalography in pediatric epilepsy, Indian paediatrics volume 55, October 15, 2018