

Neuroimaging Abnormalities in Children with First Afebrile Seizure

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Abstract: **OBJECTIVE-**To determine the incidence and type of neuroimaging abnormalities in children presenting with a first afebrile seizure.

METHODS: In a prospective observational study 75 children who were admitted with first afebrile seizure in department of pediatric N.S.C.B . M.C.H Jabalpur were underwent brain CT scan between Aug.2010 to July2011. Neuroimaging was performed (75/81) of these children within 48hours of their arrival to the Emergency Department. We defined first seizure using the international league against epilepsy(ILAE).

RESULT:-Neuro-imaging abnormality were found in 66.7% cases. There was a significant relationship between abnormal neuro-imaging and focal seizure ($P < .001$). 52.94% cases of GTCS and 83.8% cases of partial seizure have abnormal neuro-imaging .Most common abnormality observed in our study was Neurocysticercosis 26.7%(20/75) followed by Tuberculoma 26% (13/75).

CONCLUSION:-Incidence of neuro-imaging abnormality in children presenting with first afebrile seizure is high in developing countries like india due to high prevalence of NCC and tuberculosis so neuro-imaging should be considered in any child with first afebrile seizure.

Key Words:-Afebrile seizure, Neuroimaging ,Neurocysticercosis, Tuberculome.

I. Introduction

Seizure are common neurological disorders in the pediatric age group and occur in 10% of children . 5% of all medical attendances to accident and emergency department are related to seizures. The purpose of performing a neuroimaging study in a child with first afebrile seizure is to detect a serious condition that may require immediate intervention. Guidelines for obtaining emergent neuroimaging in adult patients presenting with seizures have recently been published. It is recommended that emergent brain computed tomography (CT) scan should be performed for most adults with a new-onset seizure.

The prevalence of abnormal neuroimaging in an adult with a new-onset seizure is 34% to 45%. However, the role of emergent neuroimaging in children presenting with first afebrile seizure is still not well-defined. Based on several studies, the prevalence of abnormal neuroimaging in pediatric patients with a new-onset afebrile seizure is estimated to be 0% to 21% [1] . Nevertheless, the American Academy of Neurology [7] states that these evidences are not sufficient to make a recommendation at the level of guideline for the use of routine neuroimaging in children with a new-onset seizure. The objective of this study was to determine the incidence of neuroimaging abnormalities in children with first afebrile seizure

AIMS AND OBJECTIVES

- To determine the prevalence of Neuro Imaging abnormality in Children (1 month to 14 years) with first afebrile seizure.
- To collect evidence sufficient to make a recommendation for the use of routine neuro-imaging in children with first episode of afebrile seizure.

II. Material & Methods

METHODS:- In this study 75 children aged between one month and 14 years with a new-onset afebrile seizure, admitted to the Paediatric Ward N.S.C.B M.C.H Jabalpur (M.P) were prospectively enrolled from August 2010 to July 2011. We defined the first seizure using the International League against Epilepsy (ILAE) criteria to include multiple seizures within 24 hours, with recovery of consciousness between seizures. We excluded seizures lasting 30 minutes or more (status epilepticus), and febrile seizures, because these disorders are diagnostically and therapeutically different. Patients with their first afebrile seizure and absence of any laboratory abnormalities were entered into the study.

Historical and clinical data :- included patient's age, sex, and the presence of any predisposing conditions, generalized or focal type of seizure, temperature, focal neurologic signs, Glasgow coma scale and any other abnormal findings in the neurologic examination..

Laboratory data:- included serum electrolytes, calcium, magnesium (if performed), and blood sugar, mantoux test.

Neuroimaging data:- CT scans were performed within 48 hours of arrival to hospital. All the emergent neuroimaging studies were conducted with and without the injection of contrast medium.

Statistical analyses were conducted using SPSS software. Variables were reported as mean \pm SD. χ^2 analysis was performed to determine the correlation. *P* value of <0.05 was considered statistically significant.

III. Result

There were 416 patients admitted with the diagnosis of seizure over this one-year period. 81(19.5%) of these patients had new-onset afebrile seizures and 92.6%(75/81) patients underwent neuroimaging formed our study group. There were 39 (52%) males and 36 (48%) females. The mean \pm SD age of male patients was 79.62 \pm 52 months and female patients was 89.89 \pm 52.9 months. (range: one month – 14 years)

Neuroimaging was obtained in 75 (92.6%) patients. Emergent CT scan, as an initial study, was performed in 69 (92%) and MRI in 6(8%) patients. Neuroimaging results were normal in 25(33.3%) patients. Clinically-significant neuroimaging results were reported in 50 (66.7%) patients (Table 1)

Table-1
Neuroimaging abnormalities of studied cases

Neuroimaging	No. Of cases	95% CI
Normal	25(33.3%)	22.72-46.34
Abnormal	50(66.7%)	51.91-85.09

Most common neuroimaging abnormality observed was NCC 26.7% (20/75) followed by tuberculoma 17.3%(13/75)

Table2
Neuroimaging abnormalities

Neuroimaging report	Frequency	Percent
Normal	25	33.3
NCC	20	26.7
Tuberculoma	13	17.3
Infract	4	5.3
Tumor	4	5.3
Misc.	9	12
Total	75	100.0

(Misc:-Cerebral atrophy-1, Multiple demyelinating lesion-1, Neuronal migration defect-1, Periventricular leukomalacia-1, Hydrocephalus-1, Gliosis-1, Hemorrhage-1, Calcification-1, Post ictal edema-1)

37(49.3%) patients presented with focal and 38 (50.7%) with generalized seizures. Out of 37 patients with focal seizures, 31 (83.8%) and out of 38 with generalized seizures 19 (50%) had abnormal neuroimaging results. A significant relationship was also found between the facility of seizure and abnormal findings in neuroimaging (Chi-square test, *P* < 0.001) (Table 3).

Table-3
Correlation between type of seizure and abnormal neuroimaging.

Neuroimaging	Seizure		
	Focal	General	Total
Abnormal	31(83.8%)	19(50%)	50(66.7%)
Normal	6(16.2%)	19(50%)	25(33.3%)
Total	37(49.3%)	38(50.7%)	75(100%)

Table-4
Correlation between neurological examination(GCS) and neuroimaging abnormalities.

Neuroimaging	GCS<9	GCS>9	Total cases
Normal	3(12%)	22(88%)	25
Abnormal	10(20%)	40(80%)	50

$\chi^2=0.291, P>0.05$ (Not significant)

Our study shows no significant association between neuroimaging abnormalities and abnormal neurological examination(low GCS<9).

Our study shows that mantoux positivity in CNS tuberculoma was 30.7% and history of contact was found in 38.4% cases. statistical significance observed between mantoux positivity and tuberculoma ($P<.05$).

IV. Discussion

Approximately 4 – 6% of children are expected to have a seizure by the age of 16 years. About 70% of these children are admitted and undergo different investigations. The role of emergent neuroimaging for children with a new-onset afebrile seizure is not well-understood. This is because the prevalence of neuroimaging abnormalities in this group has yet not been determined. However, regarding the results reported in the literature for adults, there has been a relatively high prevalence (between 34 – 45%) of CT scan abnormalities in adults with a new seizure. As a result, a recommendation has been published to perform emergent neuroimaging in large population of adults having their first seizure.² So far, several studies have reported the prevalence of abnormal neuroimaging in children with new-onset seizures. The prevalence of abnormal neuroimaging in these studies ranged between 0 – 21%³. The proportion of children with febrile seizures ranged between 17% and 71. It is important to note that children with febrile seizures, either simple or complex, are at low risk of neuroimaging abnormalities.⁷ Recently, **Sharma et al**⁴ reviewed a large number (n = 500) of patients presented with new-onset afebrile seizures. They excluded patients with febrile seizure (simple or complex) and those with recurrent seizures. Neuroimaging was performed in 475 patients and they reported the prevalence of 8%, as clinically significant abnormal neuroimaging. Their study was reliable because of the selected exclusion criteria.

Our study enrolled 81 patients with their first afebrile seizure. All patients with simple or complex febrile seizures, as well as those with recurrent seizures were excluded. Neuroimaging was performed in 75 patients and abnormalities were found in 66.7% of cases. The results showed that there was a significant relationship ($P < 0.001$) between focality of the seizure and abnormal neuroimaging.

Table:-

Studies	Total no. cases	Normal	Abnormal
Our study	75	25 (33.3%)	50 (66.7%)
Sujit Sharma et al (2003) ⁷	475	437 (92%)	38 (8%)
Sinome CV et al (2006) ⁶	387	273 (80.4%)	114 (19.6%)
Hussain I et al (2008) ¹	100	90 (90%)	10 (10%)
Shlomo S et al (2001) ¹⁰	218	172 (79%)	45 (21%)
Shipra Mathur et al (2007) ⁵		68%	32%
Azita T et al (2011) ¹¹	140	112 (80%)	28 (20%)

Result of our study shows a considerably higher proportion of neuroimaging abnormalities which includes various findings such as NCC, Tuberculoma, infarct, tumor, misc. **Shipra Mathur et al**⁵ conduct study in north India shows prevalence of abnormal neuroimaging was 32% although our results are higher than stated prevalence **Shipra Mathur et al**⁵ but our neuroimaging finding correlates with their finding. Study conducted elsewhere reported of 8-20% but these studies were conducted in developed countries where the prevalence of tuberculosis and NCC is low. Thus our results show a higher prevalence of neuroimaging abnormalities.

Most common neuroimaging abnormality observed was NCC (40%) followed by tuberculoma (26%) that is similar to Shipra Mathur et al⁵ (2007).

In our study various confounding factors may have direct correlation with abnormal neuroimaging findings which includes low socioeconomic status, lower literacy rate, poor hygiene and poor nutritional status and higher prevalence of tuberculosis and NCC. There for our results are not comparable to other reported studies (**Simone CV et al**⁶, **Hussain I et al**¹, **Sujit Sharma et al**⁷) conducted in developed countries who observed various neuroimaging findings such as haemorrhage, brain tumor, volume reduction of cerebral hemisphere and vascular lesion.

In our study 50% cases of generalized seizure and 83.8% cases of partial seizure have abnormal neuroimaging. partial seizure abnormality were similar to those of **George et al**⁸ (2006).

Our study shows no significant association between neuroimaging abnormalities and abnormal neurological examination (low GCS < 9). But **Hussein et al**¹ shows significant association. Our result was not comparable due to higher proportion of NCC and tuberculoma cases presenting with normal neurological examination at the time of admission.

Our study shows that Mantoux positivity in CNS tuberculoma was 30.7% and history of contact was found in 38.4% cases. Statistical significance observed between Mantoux positivity and tuberculoma ($P < .05$). **D. Vijaya Shekaran et al**⁹ (2006) showed that 21.2% Mantoux test and 30.4% contact positivity were found in CNS tuberculoma and the results were comparable with our study.

In our study Parietal lobe was commonest site for inflammatory granuloma followed by frontal lobe.

Based on our findings, we recommend that neuroimaging should be performed in children with their first afebrile seizure in area having high prevalence of NCC, tuberculosis.

V. Conclusion:-

Incidence of neuro-imaging abnormality in children presenting with first afebrile seizure is high in developing countries like India due to high prevalence of NCC and tuberculosis so neuro-imaging should be considered in any child with first afebrile seizure.

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