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Original Research Article

Identification and comparing the risk factors of new onset afebrile seizures with neuroimaging studies in children

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ABSTRACT

Background: The study was aimed to identify the risk factors associated with new onset afebrile seizures by using neuroimaging techniques and comparing the same with neuroimaging studies in children of different age groups.
Methods: This prospective observational study included 65 children aged 1 month to 16 years with afebrile seizures, admitted to the tertiary care hospitals in Chennai during the period from July 2014 to August 2016. Neuroimaging was done in all the patients. The primary outcome measure was identification of risk factors/clinical variables, (if any) that could predict individuals at high or low risk for neuroimaging abnormalities.
Results: No statistical significant association was seen between differences in age group among children(p=0.127) and gender (p=0.185). Type of seizures, Number of seizure episodes and duration of seizure episodes seemed to be an important risk factor and a statistically significant association was observed between them and neuroimaging abnormalities with p values of 0.022, 0.008 and 0.001 respectively.
Conclusion: Our findings indicate that neuroimaging techniques were helpful in assessing the abnormalities related to new onset afebrile seizures

Keywords: Neuroimaging studies, New onset afebrile seizures, Risk factors

INTRODUCTION

Afebrile seizures are very common in neurological disorder in children with worldwide occurrence of 10.5 million children under 15 years.[1] The reason for the incidence is still unknown but improvement of diagnostic procedures enhances the chance of finding the related etiology.

Neuroimaging studies are one of the important management modalities in revealing the risk factors related with causes of afebrile seizures. Previous studies reveal that abnormal neuroimagings in children with newonset afebrile seizure is estimated to be 0-21%.[2] The American college of Emergency Physicians recommended neuro imaging techniques (MRI, CT and neurosonogram) to find out the risk factors related to afebrile seizures for younger children (<1 year) and for those with unexplained neurological abnormalities, history of focal seizures, motor or cognitive developmental delay, or findings on electroencephalography (EEG) that are incompatible with benign primary generalized or partial epilepsy of childhood.[3,4] Of the three imaging techniques, MRI was preferred because it gives more sensitive results than other techniques especially in detecting different brain pathologies such as focal cortical dysplasia, vascular malformations and cerebral dysgeneis.[5,6]

The present study was conducted with the aim to identify the risk factors associated with new onset afebrile seizures by using neuroimaging techniques and comparing the same with neuroimaging studies in children of different age groups.

METHODS

The present prospective observational study was conducted on 65 children aged 1 month to 16 years with afebrile seizures, admitted to the tertiary care hospitals during the period from July 2014 to August 2016.

After getting approval from Hospital ethics committee, children of age 1 month to 16 years with new onset afebrile convulsive episode(s) were included in the study. Informed consent was obtained from the parent or the legal guardian of the study subjects after explaining to them in detail the nature of the study.

Neonatal seizures with fever, patients presenting with seizures following acute antecedent events like drugs, toxins and trauma, children with chronic neurological illness like cerebral palsy, mental retardation and pervasive developmental disorder with seizure disorders were excluded from the study.

The complete history (antenatal, natal and postnatal history) and clinical data of the patients were collected and noted in a pre-structured proforma. The patients were reviewed by specialized doctors for detailed neurological examination specifically to look for focal neurologic signs and any other abnormal findings.

After stabilization to the conditions, neuroimaging was done and sedation was given if required to reduce motion artefacts. It was done either as urgent or non-urgent study.

MRI was preferred in most situations as it detects the neuroimaging abnormalities efficiently. CT and neurosonogram were done in the patients that cannot afford MRI. MRI was performed at 3 Tesla. The entire imaging was evaluated by an experienced pediatric radiologist and reassessed in cases of doubt with pediatric neurologists. The Findings were documented in the proforma.

Primary outcome measure

Identification of risk factors/clinical variables, (if any) that could predict individuals at high or low risk for neuroimaging abnormalities.

Statistical analysis

The data collected from the patients was entered in a Microsoft Excel spreadsheet and analyzed using SPSS v16.0. All the categorical variables were expressed either as percentages or proportions. The comparison of categorical variables was done using Chi square test or Fisher's exact test based on the number of observation. All 'p' values less than 0.05 were considered statistically significant.

RESULTS

Table 1 presents the comparison of risk factors of new onset afebrile seizures in children with the neuroimaging abnormalities evaluated by different neuroimaging techniques.

All the 65 patients included in the study underwent neuroimaging, mostly MRI (n = 58). 5 had a CT scan and 2 patients had neurosonogram. Imaging abnormalities was observed in 22 patients.

Among 22 children with neuroabnormalities adolescent group (10-16 years of age) was affected more at a rate of 63.6% (n = 14) followed by infants (n = 5), toddlerhood (n = 2) and school age children (n = 1). No significant association was observed between difference in age group and abnormalities noticed (p = 0.127).

Neuroimaging abnormalities were observed more in boys (59.1%) than girls (40.9%) but no statistically significant association was seen (p=0.185).

Type of seizures seemed to be an important risk factor. Among them neuroimaging abnormality was most commonly found generalized seizures (63.6%) followed by partial seizures (36.4%). But statistically significant difference was seen between partial seizures and neuroimaging abnormalities (p=0.022).

In our study, 53presented with a single seizure episode (82%) while 12 patients (18%) developed one or more episodes after admission. Of these 12 children, 8 had abnormal neuroimaging. Seizures occurring for more than one episode was statistically significant (p=0.008).

The duration of seizures in our study population was such that 54 out of 65(83%) had episodes lasting under 5 minutes while 11 (17%) had episodes lasting more than 5 minutes. Among those who had seizures lasting more than 5 minutes, 91% had neuroimaging abnormality which was significant (p=0.001).

Among 65 children with seizures, 4 needed medication control of which 3 children had neuroimaging abnormality. However, this difference was not statistically significant.

Among 12 children with multiple episodes of seizures, 4 needed medication control of which 3 children had neuroimaging abnormality. However, this was not statistically significant (Table 2).

Table 1: Comparison of risk factors with neuroimaging abnormalities.

Risk factors			NIS		Total (n=65)
			Normal study (n=43)	Abnormal study (n=22)	
Age	Infants	Count	3	5	8
		% within age	37.5%	62.5%	100.0%
		% within NIS	7.0%	22.7%	12.3%
	Toddlerhood	Count	1	2	3
		% within age	33.3%	66.7%	100.0%
		% within NIS	2.3%	9.1%	4.6%
	Preschool	Count	5	-	5
		% within age	100.0%	-	100.0%
		% within NIS	11.6%	-	7.7%
	School age	Count	2	1	3
		% within age	66.7%	33.3%	100.0%
		% within NIS	4.7%	4.5%	4.6%
	Adolescence	Count	32	14	46
		% within age	69.6%	30.4%	100.0%
		% within NIS	74.4%	63.6%	70.8%
Gender	Boys	Count	23	13	36
		% within sex	63.9%	36.1%	100.0%
		% within NIS	53.5%	59.1%	55.4%
	Girls	Count	20	9	29
		% within sex	69.0%	31.0%	100.0%
		% within NIS	46.5%	40.9%	44.6%
Types of seizures	Generalized	Count	35	12	47
		% within TOS	74.4%	25.6%	100.0%
		% within NIS	81.4%	63.6%	75.4%
	Partial	Count	8	10	18
		% within TOS	45.5%	55.5%	100.0%
		% within NIS	18.6%	36.4%	24.6%
Number of episodes	Single episode	Count	39	14	53
		% within NOE	73.6%	26.4%	100.0%
		% within NIS	90.7%	63.6%	81.5%
	Multiple episodes	Count	4	8	12
		% within NOE	33.3%	66.7%	100.0%
		% within NIS	9.3%	36.4%	18.5%
Duration of episodes	≤5minutes	Count	42	12	54
		% within DOS	77.8%	22.2%	100.0%
		%within NIS	97.7%	54.5%	83.1%
	>5minutes	Count	1	10	11
		% within DOS	9.1%	90.9%	100.0%
		% within NIS	2.3%	45.5%	16.9%

Table 2: Treatment imposed for multiple episodes of seizures.

Multiple episodes of seizures			NIS		Total (n=12)
			Normal study (n=1)	Abnormal study (n=11)	
Medication	Needed medication	Count	1	3	4
		% within Med	25.0%	75.0%	100.0%
		% within NIS	100.0%	30.0%	36.4%
	Not needed medication	Count	-	8	8
		% within Med	-	100.0%	100.0%
		% within NIS	-	70.0%	63.6%

DISCUSSION

Neuroimaging techniques are usually employed in children with first afebrile seizure to detect who are at high risk and requires immediate medical intervention. In the present study, the prevalence of neuroimaging abnormalities were found in 33.8% of patients (n = 22). This was similar to the observations of Al-shamiet al.[7]

We also noted that adolescents had a significantly higher incidence of imaging abnormalities than other age groups. This is in agreement with the findings of the study of Rasool et al and Tavassoliet al.[8,9]

Male preponderance was observed in the study, but this difference was statistically significant and not considered as an important risk factor associated with neuroimaging abnormality. This in contrast to the studies of Al-shami et al.[7] In his study gender was seemed to be an important risk factor but the difference was statistically insignificant (p = 0.054).

The most prominent finding was that children with focal onset seizures showed a higher incidence of focal seizures (55.5%) than those with generalized seizures (25.6%) and the difference was found to be statistically significant. Similar observations were seen in the studies of Al-shami et al.[7] However in their study the difference was not statistically significant (p = 0.77).[8] Garvey et al conducted a retrospective study on children who existing with a first onset afebrile time seizure with a subset of 37 children for whom the seizure had documented focal onset.[10]

The findings of the present study illustrate that duration of episodes were considered as an important risk factors associated with neuro imaging abnormalities (p = 0.001). Similar findings were also noticed by Al-shamiet al.[7] However, study by Dayan et al revealed the similar inference by bivariate analysis but no significant association was seen by multivariate analysis.[11]

Number of incidence of seizure episodes were found to be a risk factor related with imaging abnormalities. In our study, a significant association was noticed (p=0.008) between multiple episodes of seizures and abnormal neuroimaging. Similar results were also demonstrated by Aprahamianet al.[12]

In this study, medical management was given for 4 patients. Of them 3 patients had shown brain imaging abnormalities. Patients who presented with their first afebrile seizure were followed up in paediatric neurology and for patients who developed further seizures were reviewed by the paediatric neurology department.

Limitations of the study

- Present study involved only those children admitted to our paediatric inpatient department (a department in a tertiary care referral hospital) and hence it does not reflect data from the entire community.
- In our study, the children recruited mostly belonged to the adolescent age group, hence it was not possible to extensively analyse the other groups.
- Our study was conducted with 65 children admitted with afebrile seizure. Hence, we were not able to make definite recommendations owing to our small sample size.

CONCLUSION

The findings of the study conclude that neuroimaging techniques were helpful in evaluating the abnormalities related to new onset afebrile seizures particularly in children.

Recommendations

- Routine neuroimaging to be done for all children when afebrile seizures are associated with risk factors such as: focal seizures, prolonged, multiple seizures requiring anticonvulsants neurological abnormality, infancy and adolescence.
- Neuroimaging for children with new onset afebrile seizure is to be considered if other causes are excluded.

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