



TO DETERMINE THE FREQUENCY OF ABNORMAL ELECTROENCEPHALOGRAPH IN CHILDREN PRESENTING WITH AFEBRILE SEIZURES

Dr. Shahida Nazir¹, Dr. Ayesha Abdul Karim², Dr. Mimpal Singh³, Dr. Sumaira Haamid⁴, Dr. Aneela Anjum⁵, Dr. Liaqat Ali⁶

^{1,5,6} Senior Registrar, Pediatrics Medicine Unit 2 Mayo Hospital Lahore, Pakistan

² Post graduate resident, Pediatrics Medicine Unit 2 Mayo Hospital Lahore, Pakistan

³ Assistant professor, Pediatrics Medicine Unit 2 Mayo Hospital Lahore, Pakistan

⁴ Medical officer, Pediatrics Medicine Unit 2 Mayo Hospital Lahore, Pakistan

Conflicts of Interest: Nil

Corresponding author: Dr. Shahida Nazir

Abstract:

Background: Non-febrile or afebrile seizures may indicate epilepsy. Afebrile seizures have many causes. Physicians attempting to determine the cause of an afebrile seizure should obtain more information with the help of detailed clinical history, electroencephalography and neuroimaging. The study is an effort to determine the frequency of abnormal electroencephalograph in children presenting with afebrile seizures

Methodology: This cross sectional study was conducted at Medicine Unit II, Department of Pediatric, Mayo Hospital, Lahore from 8-5-2018 to 8-11-2018. Total 100 children undergo EEG. All EEG were performed and abnormal EEG was labeled. All data was entered is specially designed Performa.

Results: The mean age of the patients was 6.58 ± 3.42 years. There were 56(56%) males and 44(44%) females in our study. The mean duration of first episode was 2.98 ± 0.79 . There were 49(49%) patients with abnormal EEG findings while 51(51%) had no abnormal EEG findings. There was no significant association between Abnormal EEG and age groups. There was no significant association between Abnormal EEG and duration of first episode as the p-value was not significant (p-value=0.49).

Conclusion: The frequency of abnormal EEG in children presenting with afebrile seizures was EEG abnormalities were seen in 49% patients.

Keywords: Abnormal electroencephalo graph, children, afebrile seizures

Introduction

Nonfebrile or afebrile seizures may indicate underlying disease or epilepsy. The patient history can often distinguish epileptic seizures from nonepileptic disorders by identifying the events directly preceding the convulsion, associated conditions, and details of the seizure, including triggers, length, and type of movements.¹ Afebrile seizures have many causes. Physicians attempting to determine the cause of an afebrile seizure should obtain more information with the help of a detailed clinical history, electroencephalography, and neuroimaging.²

Electroencephalogram has long been an integral part of evaluation of a child with first episode of afebrile seizure. Several studies have backed up its routine use in pediatric neurology till date and management guidelines also have adopted it.³ Electroencephalography should be performed 24 to 48 hours after a first seizure because of its substantial yield and ability to predict recurrence. Neuroimaging is recommended for adults, infants, and children who have cognitive or motor developmental delay or a focal seizure.¹

One study showed that frequency of abnormal EEG was 40% in children presenting with afebrile seizures.⁴

Shinnar et al., found EEG abnormalities in 42.05% patients in the study conducted by them.⁵ These findings were consistent with similar observations made and King et al.⁶ They reported EEG abnormalities in 34% and 51% depending upon the time of EEG (less than 24 vs after 24 hrs of seizures).⁷ Rasool et al., in a study conducted in Kashmir (India), showed that the frequency of abnormal EEG was 56.2% in children presenting with afebrile seizures.⁸

The rationale of this study is to determine the frequency of abnormal EEG in children presenting with afebrile seizures. Literature has shown that the frequency of abnormal EEG was very high in children with afebrile seizures. But there is no local evidence available which could show the extent of problem in local population. So through this study, we want to get the evidence so that we may be able to implement the results of this study in future and will be able to recommend to screen the children with afebrile seizures and manage neonate accordingly. This will help to improve our practice and local guidelines for screening of children with afebrile seizures.

Materials and Methods:

Here a Cross sectional study was conducted at Medicine Unit II, Department of Pediatric, Mayo Hospital, Lahore

for a duration of 6 months after approval of synopsis i.e. 8-5-218 to 8-11-2018. Sample size of 100 children is calculated with 95% confidence level, 10% margin of error and taking expected percentage of abnormal EEG i.e.40% in children with afebrile seizures. After approval of the ethical committee, Children of age1-12 years, of either gender presenting with afebrile seizures (as per operational definition) were included. Patients with seizure due to toxin or trauma (on medical record), those with chronic neurologic illness like cerebral palsy, mental retardation, and pervasive development disorders (on clinical examination), or Children with second episode of seizures (on history) were excluded.

Total 100 children who met the inclusion criteria were included in the study from emergency of Department of Pediatrics, Mayo Hospital, Lahore. After taking informed consent from parents, demographic variables (name, age, and duration of seizures) were also obtained. Then parents were advised to present in OPD after 4 days of seizures. Then all children undergo EEG by using 18-channel EEG machine (Model EE 18) from Recorder and Medicare System under general anesthesia. All EEG were performed by a single senior consultant with assistance of researcher. Abnormal EEG was labeled (as per operational definition).

The data was entered and analyzed through SPSS version 20. Quantitative variables like age and duration of seizures were presented as mean and Standard Deviation. Qualitative variables like gender and abnormal EEG was presented as frequency and percentage. Data was stratified for age, gender and duration of seizures. Post-stratification, chi-square test was applied with P-value ≤ 0.05 was taken as significant.

Results:

The mean age of the patients was 6.58 ± 3.42 the minimum age was 1 year and maximum was 12 years as shown in Table-1. There were 56(56%) males and 44(44%) females in our study (Table-2). The mean duration of first episode was 2.98 ± 0.79 the minimum duration was 2 and maximum was 4 as described in Table-3. There were 49(49%) patients with abnormal EEG findings while 51(51%) had no abnormal EEG findings as shown in Table-4. There was no significant association between Abnormal EEG and age groups as the p-value was not significant. (p-value=0.18) as presented in Table-5. There was no significant association between Abnormal EEG and gender as the p-value was not significant (p-value=0.074) described in Table-6. There was no significant association between Abnormal EEG and duration of first episode as the p-value was not significant (p-value=0.49) as shown in Table-7.

Table 1: Age of patients

N	100
Mean	6.58
Standard Deviation	3.42
Min	1.0
Max	12.0

Table 2: Gender of patients

	Frequency	Percent
Male	56	56.0
Female	44	44.0
Total	100	100.0

Table 3: Descriptive statistics for duration of First episode

N	100
Mean	2.98
Standard Deviation	0.79
Min	2.0
Max	4.0

Table 4: Abnormal EEG Findings

	Frequency	Percent
Yes	49	49.0
No	51	51.0
Total	100	100.0

Table 5: Abnormal EEG Findings stratified for Age

Age groups	Abnormal EEG		Total
	Yes	No	
1-4	16(32.7%)	17(33.3%)	33(33%)
5-8	17(34.7%)	10(19.6%)	27(27%)
9-12	16(32.7%)	24(47.1%)	40(40%)
Total	49(100%)	51(100%)	100(100%)

Chi-square= 3.41, p-value= 0.18

Table 6: Abnormal EEG Findings stratified for Gender

Gender	Abnormal EEG		Total
	Yes	No	
Male	23(46.9%)	33(64.7%)	56(56%)
Female	26(53.1%)	18(35.3%)	44(44%)
Total	49(100%)	51(100%)	100(100%)

Chi-square= 3.20, p-value= 0.074

Table 7: Abnormal EEG Findings stratified for Duration of First Episode

Duration of First Episode	Abnormal EEG		Total
	Yes	No	
2	16(32.7%)	16(31.4%)	32(32%)
3	16(32.7%)	22(43.1%)	38(38%)
4	17(34.7%)	13(25.5%)	30(30%)
Total	49(100%)	51(100%)	100(100%)

Chi-square= 1.44, p-value= 0.49

Discussion:

Afebrile seizures are one of common problem in children of all ages. This might be due to birth asphyxia,

neurocysticercosis and nervous system infections and other risk factors.⁹ The basis of incidence can be evaluated by EEG. It is mostly useful in investigating afebrile epileptic seizures and its risk of recurrence. It is advantageous to perform neuroimaging in children who had two or more afebrile epileptic seizures and who do not have EEG features of idiopathic epilepsy. Magnetic resonance imaging is superior to computed tomography in demonstrating elusive brain developmental abnormalities.²

According to Rasool et al 2012¹⁰ their sample of patients constituted male (58.7%) and (41.3%) females. In their study abnormal EEG findings were present among (58.7%) males and (38.6%) females. Male preponderance was at par with studied conducted by Rasool et al, Simone Carreiro et al and Maytal J also reported male preponderance with the incidence in males being 58.7%, 55.3% and 51.51%.^{8, 11} Whereas our study also reported similar findings. Whereas in our study abnormal EEG findings were 46.9% among males and 53.1% among females. These findings were different from the findings of our study as in our study females were dominating.

According to Tinmaswala et al 2015 in the age group of 6m-6yrs the most common type of seizures seen were complex febrile seizures and their frequency was 61.11%.¹² Another study by Akhter Rasool et al¹⁰ found that in between 6m-6yr the incidence of complex febrile seizures to be 55% and the incidence of generalized and partial seizures and of undetermined seizures to be 32%, 8% and 5% respectively. Various types of seizures after 6yr observed were generalized, partial and complex seizures which were seen in 47.7%, 44.3% and 5.1% patients respectively. Tinmaswala et al 2015 conducted a study to find out incidence of EEG abnormalities in first onset afebrile and complex febrile seizures. In their study EEG abnormalities were found in 40% patients.¹² Shinnar et al.,⁵ found EEG abnormalities in 42.05% patients in the study conducted by them. Another study conducted by King et al., reported EEG abnormalities in 34% and 51 % depending upon the time of EEG.

In case of first episode of complex febrile seizures EEG abnormalities were reported by Yucel o et al¹³ to be 44.65%. These above reported findings are similar to the findings of our study as in our study the frequency of abnormal EEG findings was 49%. The only study which reported completely different results was done by Maytal et al^{6,11} in this study EEG abnormalities found was 0%. On analyzing individual abnormalities in EEG, King et al⁶ reported that EEG is less likely to be abnormal if done late after episode of seizure.

The incidence of neuroimaging abnormality compared too many other studies such as those done by Poudel et al, Rasool et al, Kalnin et al, Mathur et al, Mohammadi et

al which showed neuroimaging abnormality to be around 27 % to 35% in new onset afebrile seizures^{9, 10, 14-16}. According to Rasool et al 2012 EEG abnormality was found in 56.2% patients.¹⁰ Shinnar et al. found EEG abnormality to be present in 42% of patients. These findings are also similar to the findings of our study as previously discussed the frequency of abnormal EEG in our study was 49%. These findings were also consistent with similar observations made by Al-Sulaiman et al.¹⁷ and Doose et al.¹⁸ Similar observations were made by Baheti et al.,¹⁹ Jasons et al.,²⁰ and Gilbert et al.,²¹.

Conclusion:

The frequency of abnormal EEG in children presenting with afebrile seizures was EEG abnormalities were seen in 49% patients. EEG findings help in identifying the brain developmental abnormalities among children with afebrile seizures particularly among the infantile age groups.

References:

1. Wilden JA, Cohen-Gadol AA. Evaluation of first nonfebrile seizures. *Am Fam Physician* 2012;86(4):334-40.
2. Michoulas A, Farrell K, Connolly M. Approach to a child with a first afebrile seizure. *BCM J* 2011;53:274-7.
3. Ghosh A, Mukhopadhyay M, Mukhopadhyay S. Electroencephalogram and first episode afebrile seizure in children. *International Journal of Research in Medical Sciences* 2017.
4. Tinmaswala MA, Valinjker S, Hegde S, Taware P. Electroencephalographic Abnormalities in First Onset Afebrile and Complex Febrile Seizures and Its Association with Type of Seizures. *JMSCR* 2015;3(8):7073-82.
5. Shinnar S, Kang H, Berg AT, Goldensohn ES, Hauser WA, Moshé SL. EEG abnormalities in children with a first unprovoked seizure. *Epilepsia* 1994;35(3):471-6.
6. King MA, Newton MR, Jackson GD, Fitt GJ, Mitchell LA, Silvapulle MJ, et al. Epileptology of the first-seizure presentation: a clinical, electroencephalographic, and magnetic resonance imaging study of 300 consecutive patients. *The Lancet* 1998;352(9133):1007-11.
7. Joshi C, Wawrykow T, Patrick J, Prasad A. Do clinical variables predict an abnormal EEG in patients with complex febrile seizures? *Seizure* 2005;14(6):429-34.
8. Rasool A, Choh SA, Wani NA, Ahmad SM, Iqbal Q. Role of electroencephalogram and neuroimaging in first onset afebrile and complex febrile seizures in children from Kashmir. *J Pediatr Neurosci* 2012;7(1):9.
9. Poudel P, Parakh P, Mehta K. Clinical profile, aetiology and outcome of afebrile seizures in children. *Journal of the Nepal Medical Association* 2013;52(189).
10. Rasool A, Choh SA, Wani NA, Ahmad SM, Iqbal Q. Role of electroencephalogram and neuroimaging in first onset afebrile and complex febrile seizures in children from Kashmir. *Journal of pediatric neurosciences* 2012;7(1):9.
11. Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M. The role of brain computed tomography in evaluating children with new onset of seizures in the emergency department. *Epilepsia* 2000;41(8):950-4.
12. Tinmaswala MA, Valinjker S, Hegde S, Taware P. Electroencephalographic abnormalities in first onset afebrile and complex febrile seizures and its association with type of seizures. *Journal of Medical Science and Clinical Research* 2015;3:7073-82.

13. Yücel O, Aka S, Yazicioglu L, Ceran O. Role of early EEG and neuroimaging in determination of prognosis in children with complex febrile seizure. *Pediatrics international* 2004;46(4):463-7.
14. Kalnin AJ, Fastenau PS, Musick BS, Perkins SM, Johnson CS, Mathews VP, et al. Magnetic resonance imaging findings in children with a first recognized seizure. *Pediatric neurology* 2008;39(6):404-14.
15. Mathur S, Southern K, Sharma M. Significant findings on cranial CT scan after a first unprovoked seizure in children from North India. *Journal of tropical pediatrics* 2007;53(6):428-30.
16. MOHAMMADI MM, TONEKABONI SH, KHATAMI A, AZARGASHB E, TAVASOLI A, JAVADZADEH M, et al. Neuroimaging Findings in first unprovoked seizures: a multicentric study in Tehran. *Iranian journal of child neurology* 2013;7(4):24.
17. Al-Sulaiman AA, Ismail HM. Clinical pattern of newly-diagnosed seizures in Saudi Arabia: a prospective study of 263 children. *Child's Nervous System* 1999;15(9):468-71.
18. Dooze H, Lunau H, Castiglione E, Waltz S. Severe idiopathic generalized epilepsy of infancy with generalized tonic-clonic seizures. *Neuropediatrics* 1998;29(05):229-38.
19. Baheti R, Gupta B, Baheti R. A study of CT and EEG findings in patients with generalized or partial seizures in Western Rajasthan. *J Indian Acad Clin Med* 2003;4:25-9.
20. Doescher JS, deGrauw TJ, Musick BS, Dunn DW, Kalnin AJ, Egelhoff JC, et al. Magnetic resonance imaging (MRI) and electroencephalographic (EEG) findings in a cohort of normal children with newly diagnosed seizures. *Journal of child neurology* 2006;21(6):490-5.
21. Gilbert DL, Buncher CR. An EEG should not be obtained routinely after first unprovoked seizure in childhood. *Neurology* 2000;54(3):635-.