

Clinico-etiological profile of children admitted with seizures to a tertiary care hospital – A cross-sectional study

Shanthi Ramesh¹, M Madhan Kumar², S Sundari³

From ¹Associate Professor, ³Professor and Head, Department of Pediatrics, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India,

²Consultant Paediatrician, Department of Paediatrics and Neonatology, Fortis Malar Hospital, Chennai, Tamil Nadu, India

Correspondence to: Shanthi Ramesh, Department of Pediatrics, Sree Balaji Medical College and Hospital, 7, Works Road, New Colony, Chromepet, Chennai - 600 044, Tamil Nadu, India. E-mail: drshanthiramesh@gmail.com

Received - 01 March 2020

Initial Review - 29 March 2020

Accepted - 25 April 2020

ABSTRACT

Background: Seizures are one of the common causes of hospitalization in children causing significant morbidity and mortality. **Objective:** The objective of the study was to study the clinico-etiological profile of children admitted with seizures. **Materials and Methods:** This cross-sectional study included 120 children admitted with seizures to the pediatric ward and pediatric intensive care unit of a teaching hospital over a period of 12 months. Clinically relevant history, demographic data, and laboratory investigations were obtained. Electroencephalogram (EEG) and magnetic resonance imaging (MRI) were done based on the clinical situation. **Results:** The sex-wise distribution of children showed an overall male predominance (male:female=1.3:1). The occurrence of convulsions was highest (60%) in the age group of 1–5 years. The majority of children had (81.7%) generalized tonic-clonic seizures. Febrile seizures (46.7%) were found to be the most common cause of seizures in children. This was followed by a seizure disorder in 19.2% and cerebral palsy in 15% of them. **Conclusion:** The etiology of seizures was identified in almost 94% of the cases through a detailed history, physical examination, laboratory workup, and with EEG and MRI studies as indicated. Thus, a thorough evaluation is recommended in every child presenting with seizures to understand the clinico-demographic profile and the etiology of seizures in children.

Key words: *Electroencephalogram, Epilepsy, Febrile seizures, Magnetic resonance imaging, Seizures*

Seizures are one of the common causes of hospitalization in children causing significant morbidity and mortality. Seizures are defined as a transient occurrence of signs and symptoms resulting from an abnormal, excessive, or synchronous neuronal activity in the brain [1]. They account for about 2% of the visits to the emergency department [2]. It has been estimated that at least 4–10% of children would have had one episode of seizure in the first 14 years of life [3]. The incidence of seizure is highest in the first 3 years of life, with decreasing frequency in the subsequent years. Central nervous system (CNS) infections are a common cause of seizures in the developing countries. Epilepsy describes a condition of susceptibility to recurrent seizures in which seizures are triggered recurrently from within the brain. Seizure disorder is a general term, and it includes any one of the following disorders, namely, epilepsy, febrile seizures (FS), and symptomatic seizures secondary to metabolic, infectious, or other etiological causes [1].

In most of the studies, FS were reported to be the most common seizure disorder in children <5 years of age [4]. About 2–5% of healthy infants and children experience at least one episode of FS between the ages of 6 and 60 months [5]. The incidence is higher in India and varies from 5 to 10% [6]. The peak incidence is around 18 months of age and is low after 3 years of age [7,8].

The two categories of FS are simple and complex. Simple FS are benign but children with complex FS are at the risk of subsequent epilepsy [9,10]. Neuroimaging, electroencephalogram (EEG), septic screen, and metabolic workup are usually done for children presenting with the first episode of non-FS.

There are limited data on the etiology of seizures among children in India. Hence, the present study was aimed to find the demographics and the common etiology of seizures among children admitted to our tertiary care center in South India.

MATERIALS AND METHODS

This prospective cross-sectional study was done in the pediatric ward and pediatric intensive care unit of a tertiary care hospital from September 2017 to August 2018. A total of 120 children aged 1 month–14 years admitted with convulsions and whose parents/guardians gave consent were enrolled in the study. Children with toxicological causes for convulsion and seizure mimic disorders were excluded from the study.

The sample size was calculated based on the average incidence of seizures to be 8% among children and with an alpha error of 5% and a precision of 5% and a non-responsive rate of 5%.

Sample size (N) = $1.96 \times 1.96 \times 8 \times 92 / 5 \times 5 = 113$ and a non-responsive rate of 5% ($5 / 100 \times 113 = 6$). Hence, the calculated sample size was 119.

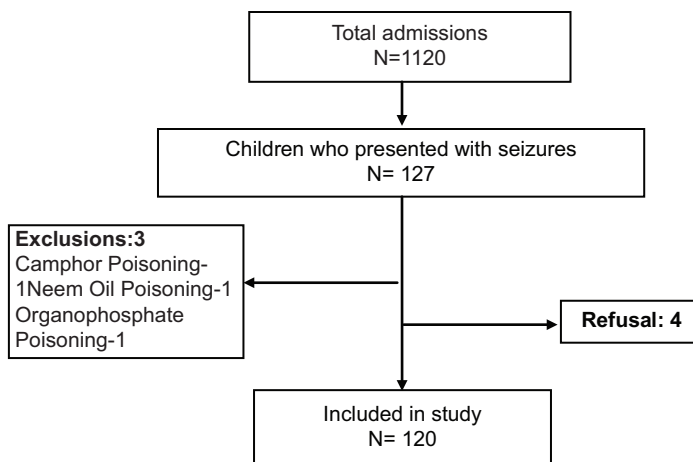
The data collection tools included a pretested, pre-structured questionnaire based on the demographic variables and details regarding the seizure activity. Clinical examination and laboratory investigations, namely, complete blood count, blood glucose, and serum electrolytes, were done for all the children. EEG and magnetic resonance imaging (MRI) scans were also done in all the children except for those who presented with simple FS. MRI is the preferred mode of imaging for children presenting with seizures due to superior anatomic resolution and characterization of the pathologic processes [11]. The institution's ethical committee approval was obtained before starting the study. Informed consent from the parents/guardians was also obtained.

Data entry and analysis of the variables were done using the Statistical Package for the Social Sciences version 16 software. The qualitative data were expressed in proportion and percentages. The difference in proportion was analyzed using the Chi-square test. $p < 0.05$ was considered statistically significant.

RESULTS

A total of 1120 children were admitted to the pediatric ward during the study period. Of them, 127 (11.3%) children had seizures as the presenting complaint. A total of 120 children were included in the study, as shown below.

Flow chart of the study population



The sex-wise distribution of children showed an overall male predominance (male:female=1.3:1). It was found that the occurrence of convulsions is highest 72 (60%) in the age group of 1–5 years. Among the 22 children with focal seizures, 10 of them had a seizure disorder, 6 of them had complex FS, 3 of them had neurocysticercosis (NCC), 2 of them had viral encephalitis, and 1 child had pyogenic meningitis.

We found that 24 (20%) of them had delayed development (Table 1). Among the 24 children who had developmental delay, 13 of them had cerebral palsy, 8 of them had a seizure disorder, and 3 of them had a congenital malformation of the brain. In the present study, 11 (9.1%) children presented to the emergency department with status epilepticus.

EEG recording was done for 84 children. Of them, 38 (45.2%) children had an abnormal EEG recording in the form of spikes and sharp waves. Eighty-four children had an MRI scan done and among them, 21 had abnormal findings in the form of schizencephaly (2), hypoplasia of corpus callosum (1), polymicrogyria, cerebral atrophy with ventricular dilatation, and intracranial calcifications.

Table 2 shows the etiology of seizures. FS56 (46.7%) was found to be the most common cause of seizures in children. Among the children with FS, 36 (64.2%) had simple FS and 29 (35.8%) had complex FS. There was one child with a metabolic disorder who presented with hypoglycemic seizures and diagnosed to have glycogen storage disorder Type I.

DISCUSSION

This hospital-based prospective study included 120 children who presented with seizures over 12 months. The sex-wise distribution of children showed an overall male predominance (male:female=1.3:1). The study done by Gowda *et al.* also reported

Table 1: Demographic details of children presenting with seizures

| Particulars | Number (%) | p value |
|----------------------------|------------|---------|
| Age group (years) | | |
| 0–1 | 14 (11.7) | 0.001 |
| 1–5 | 72 (60) | |
| 5–10 | 23 (19.2) | |
| 10–14 | 11 (9.1) | |
| Sex | | |
| Male | 69 (57.5) | 0.25 |
| Female | 51 (42.5) | |
| Type of convulsions | | |
| GTCS | 98 (81.7) | 0.01 |
| Focal seizures | 22 (18.3) | |
| Past H/o of seizures | | |
| Yes | 66 (55) | 0.001 |
| No | 54 (45) | |
| Family history of seizures | | |
| Yes | 19 (15.8) | 0.56 |
| No | 101 (84.2) | |
| Development history | | |
| Developmental delay | 24 (20) | 0.001 |
| Normal | 96 (80) | |

Table 2: Etiology of seizures

| Etiology | Number (%) |
|------------------------|------------|
| Febrile seizures | 56 (46.7) |
| Epilepsy | 23 (19.2) |
| Cerebral palsy | 18 (15) |
| Viral encephalitis | 7 (5.8) |
| Pyogenic meningitis | 4 (3.3) |
| Neurocysticercosis | 3 (2.5) |
| Metabolic | 1 (0.8) |
| Traumatic brain injury | 1 (0.8) |
| Others | 7 (5.8) |
| Total | 120 (100) |

a male predominance in the ratio of 1.2:1 [12]. Worldwide literature showed a similar ratio of 1.35:1 [13]. Seizure occurrence was most common in the age group of 1–5 years. This is in concurrence with the study done by Saravanan *et al.*, who reported that most of the seizures occurred in children <6 years of age [14]. Similar observations were made in the study by Mamillapalli *et al.* [15].

The International League against Epilepsy divides epileptic seizures into generalized and focal seizures [16]. In the present study, it was found that the majority of the children (81.7%) had generalized tonic-clonic seizures and 22 (18.3%) had focal seizures. These findings were similar to other studies by Adhikari *et al.* and Mamillapalli *et al.* [13,15].

Developmental milestones should be assessed in all cases of childhood seizure disorder. Prenatal/perinatal insults or CNS malformations present with seizures and developmental delay. In the present study, it was found that 20% of the children had delayed development. Similarly, the study by Chithambaram *et al.* reported that 28% of the children with seizures also had developmental delay [17].

Etiological analysis revealed FS to be the most common cause of seizures in children. This was followed by epilepsy in 19.2% of them. These results were comparable to findings from other studies by Waruiru *et al.* and Delpisheh *et al.* [6,18]. Among the children who presented with FS, 36 (64.2%) had simple and 29 (35.8%) had complex FS. Similar observations were made in studies conducted at the National Institute for Health and Care Excellence and by Seinfeld *et al.* [9,19].

Regarding CNS infections, meningoencephalitis was the cause of seizures in 5.8% of the children. In comparison, the study done in Nepal by Chaudhary *et al.* reported a high prevalence of meningoencephalitis in 15.5% of the children [20]. Singh *et al.* reported a higher prevalence of meningoencephalitis accounting for 30% of seizures in children and attributed this to the seasonal outbreaks of viral encephalitis in Uttar Pradesh [21]. In the present study, 3% of the patients presented with meningitis and these results are in agreement with a prior South Indian study done by Kumar *et al.* [22]. In the present study, only 2.5% of the patients had NCC and these findings are in agreement with a study done in South India by Saravanan *et al.* [14]. In contrast, the study from Nepal found a high prevalence of NCC (42.9%), explaining the regional differences in the disease pattern [20].

There was one child with a metabolic disorder who presented with hypoglycemic seizures and was diagnosed to have glycogen storage disorder Type I. The low prevalence of metabolic disorders may be attributed to exclusion of newborns in this study. Similar observations were made in the study by Singh *et al.* [21].

The present study had a few limitations. The study had a small sample size, and hence, the findings may not be reflective of the general population. Therefore, a multicenter study with larger sample size is recommended to overcome this limitation.

CONCLUSION

In the present study, the etiology of seizures was identified in almost 94% of the cases through a detailed history, physical

examination, and laboratory investigations, along with EEG and MRI. Thus, a thorough evaluation is recommended in every child presenting with seizures to understand the clinico-demographic profile and the associated etiology.

REFERENCES

- Mikati MA, Hani AJ. Seizures in childhood. In: Kliegman RM, Stanton BF, Geme JW, Schor NF, Behrman RE, editors. Nelson Textbook of Pediatrics. 20th ed. Amsterdam: Elsevier; 2016. p. 2823-28.
- Martindale JL, Goldstein JN, Pallin DJ. Emergency department seizure epidemiology. *Emerg Med Clin North Am* 2011;29:15-27.
- Friedman MJ, Shariief GQ. Seizures in children. *Pediatr Clin North Am* 2006;53:257-77.
- Chung S. Febrile seizures. *Korean J Pediatr* 2014;57:384-95.
- Dougherty D, Duffner PK, Baumann RJ, Berman P, Green JL, Schneider S, *et al.* Febrile seizures: Clinical practice guidelines for the long-term management of the child with simple febrile seizures. *Pediatrics* 2008;121:1281-6.
- Waruiru C, Appleton R. Febrile seizures: An update. *Arch Dis Child* 2004;89:751-6.
- Sugai K. Current management of febrile seizures in Japan: An overview. *Brain Dev* 2010;32:64-70.
- Leung AK, Hon KL, Leung TN. Febrile seizures: An overview. *Drugs Context* 2018;7:212536.
- Seinfeld DS, Pellock JM. Recent research on febrile seizures: A review. *J Neurol Neurophysiol* 2013;4:19519.
- Sadleir LG, Scheffer IE. Febrile seizures. *BMJ* 2007;334:307-11.
- Gaillard WD, Chiron C, Cross JH, Harvey AS, Kuzniecky R, Hertz-Pannier L, *et al.* Guidelines for imaging infants and children with recent-onset epilepsy. *Epilepsia* 2009;50:2147-53.
- Gowda VK, Vasanna SH, Kumar P, Lakshman RR, Govindraj P. Study of etiological profile of infantile and childhood focal seizures at a tertiary care centre in South India. *J Pediatr Neurol* 2013;11:235-40.
- Adhikari S, Sathian B, Koirala DP, Rao KS. Profile of children admitted with seizures in a tertiary care hospital of Western Nepal. *BMC Pediatr* 2013;13:43.
- Saravanan S. Profile of children admitted with seizures in a tertiary care hospital in South India. *IOSR J Dent Med Sci* 2013;11:56-61.
- Mamillapalli B, Penchalaiah A. Etiological evaluation of convulsions in children between 1 month to 5 years of age. *Int J Contemp Pediatr* 2017;4:1811-16.
- Scheffer IE, Berkovic S, Capovilla G, Connolly MB, French J, Guilhoto L, *et al.* ILAE classification of the epilepsies: Position paper of the ILAE commission for classification and terminology. *Epilepsia* 2017;58:512-21.
- Chithambaram NS, Ravichander B. Pattern of childhood epilepsy in a tertiary care hospital. *J Evol Med Dent Sci* 2014;3:13709-13.
- Delpisheh A, Veisani Y, Sayehmiri K, Fayyazi A. Febrile seizures: Etiology, prevalence, and geographical variation. *Iran J Child Neurol* 2014;8:30-7.
- National Institute for Health and Care Excellence. Clinical Knowledge Summaries: Febrile Seizures. London, UK: NICE; 2013. Available from: <https://www.cks.nice.org.uk/febrile-seizure>. [Last accessed on 2020 Mar 01].
- Chaudhary N, Gupta MM, Shrestha S, Pathak S, Kurmi OP, Bhatia BD, *et al.* Clinicodemographic profile of children with seizures in a tertiary care hospital: A cross-sectional observational study. *Neurol Res Int* 2017;2017:1524548.
- Singh RD, Suryavanshi S. A hospital-based study on clinicoetiological profile of seizures in children—a Kanpur (UP India) experience. *Int J Contemp Med Res* 2016;3:3003-7.
- Kumar R. Clinico-etiological profile of childhood seizures at a tertiary care hospital in southern India—an observational study. *Int J Res Pharm Sci* 2018;9:1280-4.

Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Ramesh S, Kumar MM, Sundari S. Clinico-etiological profile of children admitted with seizures to a tertiary care hospital – A cross-sectional study. *Indian J Child Health*. 2020; 7(5):213-215.

Doi: 10.32677/IJCH.2020.v07.i05.005