



ETIOLOGICAL EVALUATION OF SEIZURE IN CHILDREN ADMITTED IN TERTIARY CARE HOSPITAL OF NORTHERN INDIA

Pediatrics

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ABSTRACT

Introduction: Convulsions are one of the most common paediatric neurological disorder worldwide. It could either be idiopathic or secondary to disease process of brain. Incidence of convulsion is highest among children younger than 3 yrs.

Aims And Objectives: Current study was done to know the proportion of idiopathic epilepsy and secondary seizures. It further aimed to identify various aetiologies of convulsion in children between 1 month to 15 years of age.

Materials And Methods: It was a descriptive study conducted in patients admitted in emergency and indoor of department of paediatrics, Patna Medical College and Hospital, over a period of 2 years from October 2014 to September 2016. Children from 1 month to 15 years of age with seizures were studied to know the various aetiologies and proportion of idiopathic or secondary seizures.

Results: During study period, 200 children between ages 1 month to 15 years, with convulsion, were enrolled. Seizures were found to be more common in males (67.5%). Secondary seizures were present in 90% cases and idiopathic epilepsy accounted only for 10%. GTCS was the commonest type of seizure both in idiopathic epilepsy (100%) as well as in secondary seizure group (87.77%). Family history of seizure disorders was present in 13% of cases. Developmental delay was found in 11.5% cases, whereas 88.5% children were developmentally normal. Infective aetiologies were the commonest cause followed by febrile seizures. Febrile seizures were commonly seen in age group between 1 yr - 5 yrs (23.75%). Hypocalcemic seizures were mostly seen in the age group of 1 month to 1 year (17.5%). Japanese encephalitis virus and dengue virus as a cause of viral meningoencephalitis were found in 10% and 5% respectively.

Conclusion: Incidence of idiopathic epilepsy was less common than secondary seizures. GTCS was the commonest seizure type. CNS infection and febrile seizures were common causes of convulsion in this age group. Bacterial infections were the commonest CNS infections. Serum electrolytes, lumbar puncture, neuroimaging, EEG were important tools in reaching diagnosis.

KEYWORDS

CNS infections, febrile seizures, hypocalcemia, JE virus

INTRODUCTION

Convulsions are the most common pediatric neurological disorder worldwide. Around 4%- 10% children suffer at least 1 seizure (febrile or afebrile) in the 1st 16 years of life. The incidence is highest in children younger than 3 yrs of age with decreased frequency in older children [1]. A seizure or convulsion is defined as transient involuntary alteration of consciousness, behaviour, motor activity, sensation or autonomic function which is caused by excessive rate and hyper synchrony of discharges from a group of cerebral neurons. A postictal period of decreased responsiveness usually occurs in most seizure episodes. The international classification of Epileptic seizures divides epileptic seizures into two large categories- A: FOCAL (partial) in which first clinical and EEG changes suggest activation of neurons limited to parts of one cerebral hemisphere. The term simple partial refers to focal seizure with no alteration of consciousness whereas complex partial also called focal dyscognitive seizure denote focal seizure with altered awareness of surroundings. B: GENERALISED seizure in which the first clinical and EEG changes indicate synchronous involvement of all of both hemispheres [2].

Epilepsy is a disorder of brain characterised by enduring predisposition to generate seizures and by neurobiological, cognitive, psychological and social consequences of this condition. "The clinical diagnosis requires the occurrence of at least 1 unprovoked epileptic seizure with either a second such seizure or enough EEG and clinical information to convincingly demonstrate an enduring predisposition to develop recurrences." For epidemiological purposes epilepsy is considered to be present when 2 or more unprovoked seizures occur in a time frame of >24 hours [2].

SEIZURE DISORDER is a general term that is usually used to include any 1 of several disorders, including epilepsy, febrile seizures, and possibly single seizure and symptomatic seizures secondary to metabolic, infectious, or other aetiologies like hypocalcemia, meningitis etc [2]. Status epileptics refer to continuous or recurrent seizure activity without regaining of consciousness lasting for more than 5 minutes as part of an operational definition. In past cut-off time was 30 minutes [3].

The manifestation of seizure depends upon the threshold of brain to manifest a clinical seizure. Age and neuro-developmental maturity status determine the clinical manifestations and type of seizure disorder encountered.

These patients require aggressive stabilization, resuscitation and concurrent implementation of diagnostic testing, monitoring and pharmacological interventions.

AIMS AND OBJECTIVES

Convulsion is a common problem which can be idiopathic or secondary to a disease process of the brain. The clinical presentation of convulsion in these two broad groups may be quiet similar. Investigation modalities like CT scan or MRI are available which can detect disease process or structural abnormalities of the brain presenting as seizure and for which treatment can be offered. Hence it is important to separate cases of idiopathic seizures or epilepsy from secondary seizures.

Objectives Of This Study:-

- 1) To study the proportion of idiopathic epilepsy and secondary seizures.
- 2) To study the various aetiologies of convulsion in children in paediatric age group.

MATERIALS AND METHODS

Study Area- Paediatric emergency and indoor of Department of Paediatrics, Patna Medical College and Hospital, Patna, Bihar.

- Study Population- Children between age group 1 month and 15 years
- Study Period-2 yrs (from Oct2014 to Sept2016)

Inclusion Criteria: All children between 1 month-15 years presenting with seizure during study period.

Exclusion Criteria: Children less than 1 month or more than 15 yrs of age.

Study Design-Descriptive study**Tools And Parameters:**

After obtaining consent from parents/caregivers, patients were enrolled in this study. Detailed history was taken and clinical examination done. Relevant data were recorded in predesigned proforma. Investigations in form of CBC, serum electrolytes, serum calcium, and serum glucose were done. Lumber puncture and CSF Analysis were done as and when needed. EEG was done in all cases. Ophthalmoscopy, CT SCAN and/or MRI were done when required.

Statistical Analysis

The primary goal of this study was to provide descriptive statistics of the patient population. Data so collected was entered in Microsoft excel. SPSS version 22.0 for Microsoft windows was used to analyze the data. Descriptive statistics were presented as number of observations and percentage (%). The clinical and laboratory parameters of the study population were expressed in terms of mean and $\pm$ standard deviation (SD). Nonparametric categorical data were compared with Chi-square test and parametric continuous data were compared with Student's t test. P values less than 0.05 were considered statistically significant. Appropriate statistical uncertainty was expressed by the 95% confidence levels.

OBSERVATIONS AND RESULTS

Total of 200 children with seizures were enrolled in this study. Out of these 200 children, 20 (10%) had idiopathic epilepsy and 180 (90%) had secondary seizures (Fig 1). Incidence of seizures in the age group 1month-<1 yr were 40 (20%), in 1yr - <5yrs were 88 (44%) and in 5yrs-15yrs were 72 (36%). Among these 200 children, 135 (67.5%) were males and 65 (32.5%) were females.

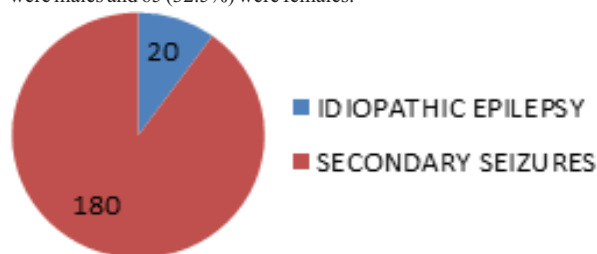


Fig 1: Proportion Of Idiopathic Epilepsy And Secondary Seizures: (N=200)

Out of 200 cases, family history of seizure disorders was present in 26 (13%) cases only. Developmental assessment was done in all 200 cases. Normal development was seen in majorities (88.5%) where as developmental delay was present in 11.5% cases. In idiopathic epilepsy cases, all 20 cases (100%) presented with GTCS type of seizure. In secondary seizures most common seizure type was GTCS in 87.77% followed by left focal in 6.67%, right focal in 5% and myoclonic was only 0.56% (table1).

CHARACTERISTICS		TOTAL NO.	PERCENTAGE
SEX	MALE	135	67.5%
	FEMALE	65	32.5%
AGE	1 MONTH -- < 1 YEAR	40	20%
	1 YEAR -- < 5 YEAR	88	44%
	5 YEAR – 15 YEAR	72	36%
Family history of seizure disorders	PRESENT	26	13%
	ABSENT	174	87%
Developmental history	DEVELOPMENTAL DELAY	23	11.5%
	NORMAL	177	88.5%
Seizure types in idiopathic epilepsy (N=20)	GTCS	20	100%
	FOCAL	0	0%
Seizure types in secondary seizure (N=180)	GTCS	158	87.77%
	LEFT FOCAL	12	6.67%
	RIGHT FOCAL	9	5%
	MYOCLONIC	1	0.56%

Most common aetiology of seizures in our study was acute bacterial meningitis (26.11%) followed by viral meningoencephalitis (19.45%),

febrile seizures in (13.89%), tubercular meningitis (8.33%), cerebral palsy (7.22%), neurocysticercosis (4.44%), hypocalcemia (3.89%), cerebral malaria (2.78%). Other causes (13.89%) include Hypoxic ischemic encephalopathy (HIE), Post-streptococcal glomerulonephritis (PSGN) with hypertensive emergency, brain abscess, hypoglycemia, trauma etc. Among viral causes of meningoencephalitis, dengue serology was present in 2 (5.71%), JE serology in 6 (17.14%), measles in 1 (2.86%) cases and specific viral agent remained unknown in 74.29% cases (table 2).

Table 2: Etiologies Of Secondary Seizures; (N= 180)

ETIOLOGIES		TOTAL NO.	PERCENTAGE
ACUTE BACTERIAL MENINGITIS		47	26.11%
VIRAL MENINGOENCEPHALITIS (N=35)	DENGUE SEROLOGY POSITIVE	2	19.45%
	JE SEROLOGY POSITIVE	6	
	MEASLES SEROLOGY POSITIVE	1	
	UNKNOWN	26	
FEBRILE SEIZURES		25	13.89%
TUBERCULAR MENINGITIS		15	8.33%
CEREBRAL PALSY		13	7.22%
NEUROCYSTICERCOSIS		08	4.44%
HYPOCALCEMIA		07	3.89%
CEREBRAL MALARIA		05	2.78%
OTHERS		25	13.89%

Most common cause of seizure in age group (1month-<1yr) in our study was acute bacterial meningitis (32.5%). Hypocalcemia (17.5%) was the second most common cause. Febrile seizures were seen in (15%), cerebral palsy (10%), viral meningoencephalitis (2.5%), and tubercular meningitis (2.5%). Other causes were HIE, hypoglycemia, dyselectrolytemia, congenital hydrocephalus and CCHD (TOF) with venous thrombosis (table 3)

Table 3: Various Etiologies Of Secondary Seizures In Age Group 1month - <1 Year (N=40)

ETIOLOGIES	TOTAL NO.	PERCENTAGE
ACUTE BACTERIAL MENINGITIS	13	32.5%
HYPOCALCEMIA	7	17.5%
FEBRILE SEIZURES	6	15%
CEREBRAL PALSY	4	10%
VIRAL MENINGOENCEPHALITIS	1	2.5%
TUBERCULAR MENINGITIS	1	2.5%
OTHERS	8	20%

Common causes in age group between 1 yr- <5 yrs were febrile seizure, VME, ABM, TBM, CP etc (Table 4).

Table 4: Various Etiologies Of Secondary Seizures In Age Group 1year -<5 Years. (n=80)

ETIOLOGIES	TOTAL NO.	PERCENTAGE
FEBRILE SEIZURES	19	23.75%
VIRAL MENINGOENCEPHALITIS	19	23.75%
ACUTE BACTERIAL MENINGITIS	14	17.5%
TUBERCULAR MENINGITIS	10	12.5%
CEREBRAL PALSY	5	6.25%
CEREBRAL MALARIA	3	3.75%
NEUROCYSTICERCOSIS	2	2.5%
OTHERS	8	10%

ABM was the most common cause of secondary seizures in age group of 5yrs-15 yrs followed by VME, NCC, TBM, CP and cerebral malaria. Other causes were PSGN with hypertensive emergency, brain abscess, trauma, mesial temporal sclerosis etc (Table 5).

ETIOLOGIES	TOTAL	PERCENTAGE
ACUTE BACTERIAL MENINGITIS	20	33.33%
VIRAL MENINGOENCEPHALITIS	15	25%
NEUROCYSTICERCOSIS	6	10%

TUBERCULAR MENINGITIS	4	6.67%
CEREBRAL PALSY	4	6.67%
CEREBRAL MALARIA	2	3.33%
OTHERS	9	15%

DISCUSSION

Seizures are the most common paediatric neurologic disorders, occurring in 10% of children [4]. Most seizures in children are provoked by somatic disorders originating outside the brain, such as high fever, infection, syncope, head trauma or hypoxia. Less than one third of seizures in children are caused by epilepsy, a condition in which seizures are triggered recurrently from within the brain.

Age plays an important role in the etiology of convulsions. 4- 10% of children suffer at least one seizure in 1st 16 yrs of life. In our study we recorded the highest incidence of seizures in the age group of 1 yr to < 5 yrs i.e. 88 (44%), followed by 72 (36%) in the age group of 5 yrs to 15 yrs and least between 1 month to < 1 yr i.e. 40 (20%). This correlates with the findings of study done by Friedman MJ et al [1] which says, the incidence of seizures is highest in children younger than 3 yrs of age, with a decreasing frequency in older children. Also a study done by Dr Shilpa Dugar et al [5] found age group 1yr- 5 yrs had maximum cases of seizures. The incidence of seizures in our study was more in males, accounting to 135 (67.5%) cases while females were 65 (32.5%), ratio being (2.07:1). The Yelandur survey found that there was a male preponderance (72%) with active epilepsy [6].

In our study idiopathic epilepsy was found in 20 (10%) cases and secondary seizures in 180 (90%). This study correlates with the study done by Johnston MV et al [7] who found less than one third of seizures in children were caused by epilepsy. In both the groups GTCS was the commonest type. In idiopathic group all 20 (100%) were of GTCS type whereas in secondary group 158 (87.77%) were of GTCS type, left focal 12 (6.67%), right focal 9 (5%) and there was 1 (0.56%) case of myoclonic seizures. Sudhir adhikari et al [8] study found that generalised tonic clonic was the most common type (69.9%). These findings are similar to the findings of our study. In our study 26 (13%) of total cases had a family history of convulsions. In a study by Chevie and Aicardi et al [9], a positive family history of seizures was present in 28% of infants with uncharacteristic seizure. Developmental history was normal in 177 (88.5%) of children and developmental delay was present in 23 (11.5%) of cases which was lower than findings of Fenichel GM [10] study who found approximately 25% of children who had recurrent seizures during the first year excluding neonatal and infantile spasm were developmentally and neurologically abnormal at the time of first seizure

In present study, out of a total of 200 cases studied, commonest cause of secondary seizure was acute bacterial meningitis found in 47 (26.11%) cases followed by viral meningoencephalitis 35 (19.45%). Febrile seizures were present in 25 (13.89%), tubercular meningitis in 15 (8.33%), cerebral palsy in 13 (7.22%), neurocysticercosis in 8 (4.44%), hypocalcemia in 7 (3.89%), cerebral malaria in 5 (2.78%) and other causes 25 (13.89%) cases. In the age group of 1 month to < 1 year acute bacterial meningitis (32.5%), hypocalcaemia seizures (17.5%), febrile seizures (15%), cerebral palsy (10%) were common causes.

In the age group of 1 year- < 5 years, febrile seizures (23.75%), viral meningoencephalitis (23.75%), acute bacterial meningitis (17.5%) tubercular meningitis (12.5%) and cerebral palsy (6.25%) were found in our study, while in the age group of 5 year -15 years, we found acute bacterial meningitis in (33.33%), viral meningoencephalitis in (25%), NCC in (10%), tubercular meningitis in (6.67%) and cerebral palsy in (6.67%) cases. CNS infections were the commonest etiology in our study. This finding correlates with the study done by Rupa Dalmia Singh et al [11], in which etiological analysis revealed CNS infections to be commonest cause of seizure in paediatric age group, followed by Space occupying lesions, epilepsy, febrile seizures and metabolic causes.

In a study done by Huang CC et al [12], intracranial haemorrhage, bacterial meningitis and metabolic disturbances were the major causes of acute symptomatic seizures in children aged 1-12 months. In our study acute bacterial meningitis, hypocalcemia and febrile seizures were common in this age group (1 month-1yr). Also in a study done by Murthy JM et al [13], he found infections of CNS and single CT enhancing lesion accounted for 95% of the etiologies in children. Our findings correlate with these findings.

Febrile seizures are the most common convulsive disorder in younger children. In one study done by Chen CY et al [14], 218 (68%) presented with seizures and fever and 299 (94%) children were younger than 6

years of age. Febrile seizures (62.1%) were the main etiology of the first seizure. In our study we got only 13.89% (25/180) of febrile seizure cases in patients of secondary seizures up to 5 years of age. This discrepancy in findings could be because our institution being a tertiary care centre, so mainly referred cases comes here.

In this present study JE serology (IgM/IgG for JE both in CSF and blood) was positive in 6/35 cases (17.14%), Dengue serology (NS1/IgM or IgG For dengue in blood and CSF) was positive in 2 (5.71%) cases and measles IgG Ab present in CSF in 1 (2.86%) case. Unknown group comprises maximum numbers 26 (74.29%).

In a study conducted by Kamarkar SA et al [15] in New Delhi between 2004-2005, 57 cases out of 151 with encephalopathy were suspected as viral encephalitis. The two most common clinical features in these cases were generalised convulsions (70.17%) and meningeal signs (59.64%). Of the 57 cases, etiological diagnosis were reached in 41 cases. The most common etiological agent identified in the study was enterovirus 71 in 20 (35.1%) patients. The other viruses identified were mums in 6 (10.5%), JE in 5 (8.7%) and measles in 4 (7%) cases. Herpes virus, Varicella zoster, rubella and dengue virus were identified in 1 case each. Our findings nearly match with the findings of above study.

Other causes of convulsions were HIE, PSGN with hypertensive emergency, hypoglycaemia, dyselectrolytemia, brain abscess, trauma etc. We recorded only 1 (0.55%) case of trauma (SAH) because traumatic cases are referred to Neurosurgery. Early epilepsy is known to occur within 24 hours of injury and is usually associated with focal seizures [16]. However in our case it was associated with GTCS type.

CONCLUSION

We concluded that secondary causes of seizures (structural or metabolic) were more common than idiopathic epilepsy. Seizure disorders were most commonly seen among 1 year to 5 years of age group. Males were affected more than females, ratio being 2.07:1. GTCS was the most common type of seizure. Infective aetiologies were the commonest cause in all age groups studied. Acute bacterial meningitis was the most common infection causing seizure. Febrile seizures were next most common cause which was seen mostly in age group 1yr- < 5 yrs. Hypocalcemic seizures were present in the age group of 1 month to < 1 year. Japanese encephalitis (flaviviridae) and dengue viruses were reported in 6 and 2 cases respectively. Family history and developmental history is also important in cases of seizure disorders.

LIMITATIONS

This was a single centric study with moderate sample size. There's need for larger multi-centric study for any generalized recommendations to be made.

Conflict of interest

None

Financial Disclosure

The authors declare that this study has not received any financial grant.

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