



CLINICO-ETIOLOGICAL PROFILE OF NEW ONSET SEIZURES IN PAEDIATRIC PATIENTS

Paediatrics

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ABSTRACT

Background: Seizures are defined as a transient occurrence of signs and/or symptoms resulting from abnormal excessive or synchronous neuronal discharges in the brain. The study aimed to assess the clinical spectrum of new onset paediatric seizures in a tertiary care rural hospital. **Material & Method:** This hospital based prospective longitudinal study conducted in department of Paediatrics at Maharishi Markandeshwar Institute of Medical Sciences and Research and associated hospital, Mullana, Ambala among 50 patients with new onset seizure. Patients were admitted in ward/icu and all the information was collected through history and examination and analysed for the blood parameters, EEG, neuroimaging, CSF analysis. The data were collected in proforma and entered in excel. The statistical methods were performed through SPSS for windows version 20, p value of < 0.05 was considered statistically significant. **Results:** Total 50 patients fulfilling inclusion criteria were included in the study. Forty-two percent (majority) of subjects in the age group of 6mo.-5yr, followed by 38% in the age group of 6yr.-12yr. 48% of study population had associated symptoms, 10% of patients had history of birth asphyxia and 24% of patients had family history of seizures. Among study participants 58% of population had low socioeconomic status as per modified kuppuswamy scale 2021. Thirty percent of study participants had abnormal neuroimaging and forty-four percent had abnormal EEG changes. In our study CNS infections were common in 1mo.-5mo. and 13yr.-18yr. of age groups. Diagnosis of I.C.S.O.L. was common in 6yr.-12yr. of age group, while metabolic derangements (all cases attributing to hypocalcemia) were common in 1mo.-5mo. of age group. Further our study finds diagnosis of seizure with unknown etiology commonest in the age group of 6yr.-18yr. In low socioeconomic class incidence of CNS infections are significantly more ($p < 0.05$). **Conclusion:** New onset seizure in a previously well children are distressful for parents, as it affects quality of life in child and sometimes it is associated with poor neurodevelopmental outcome. Clinically GTCS was the most common type of seizure. In etiological diagnosis CNS infections formed one of the major proportions among study participants. Cases of neurocysticercosis, pontine glioma and subarachnoid haemorrhage were space occupying lesions found on neuroimaging. This study documents high incidence of CNS infections among patients of low Socioeconomic class. So, preventive measures at household and community level are essential to reduce incidence of CNS infections.

KEYWORDS

Seizure, CNS infections, Neuroimaging

INTRODUCTION

Seizure is a widespread paediatric neurological disorder and also a most frequent cause of hospital admission in childhood associated with significant morbidity and mortality.¹

Term 'seizures' dates back to 6th century, it is a word of Latin origin which means "to take possession of", whereas the term epilepsy is a Greek word which means "to seize, possess, or afflict". The earliest portrayals of epileptic seizures have been recorded in the ancient Akkadian texts in Mesopotamia (2000 B.C.). It was diagnosed as the 'hand of sin' (antasubbu) by the exorcists, caused due to the Moon God.²

Seizures are defined as a transient occurrence of signs and/or symptoms resulting from abnormal excessive or synchronous neuronal discharges in the brain. 4 to 10 % of children undergo at least 1 episode of seizure in the first 16 years of age. It accounts for 1% of all emergency department visits and about 2% of paediatric emergency department visits.¹

Two or more repeated unprovoked seizures more than a day apart is termed as epilepsy.¹ 20% of total children with unprovoked seizures may develop epilepsy.³ In Indian literature, prevalence of epilepsy is 5.59 to 10 per 1000 population and subsequently males and females are equally affected in different geographical areas.⁴

The International League against Epilepsy (ILAE) 2017 classifies seizure into 3 main types which are Generalized onset, Focal onset and Unknown onset.¹ Generalize seizures originate within the cortex and rapidly engage bilaterally distributed networks and can include cortical and sub cortical structures but not necessarily entire cortex.⁴ Origin of focal seizures is limited to one hemisphere which may be discretely localized or more widely distributed.⁴ While if onset of seizure distribution is unable to determine between generalized and

focal then it is unknown onset.⁴

In emergency department, primary care physician face difficulties in the initial management along with further evaluation regarding the indications for neuroimaging especially in patients with new onset seizures.³ So, understanding clinical presentation and etiology of seizure is necessary not only to control an acute episode but also for epilepsy control in future.¹ Thus, in this study we aimed to analyse clinico etiological profile of new onset seizures in paediatric age group.

AIM

To analyze clinical spectrum of new onset pediatric seizures in a tertiary care rural hospital.

METHODS

This was a hospital based prospective longitudinal study, which included 50 patients with new onset seizures (satisfying the inclusion criteria) conducted for duration of one and half year in paediatrics department at MMIMSR, Mullana.

Inclusion Criteria

1. Patient aged between 1 month to 18 years admitted with new onset of seizures in paediatric ward/I.C.U.

Exclusion Criteria

- Diagnosed case of epilepsy/epileptic syndrome.
- Those who did not gave consent for the study

METHOD OF COLLECTION OF DATA

A prior approval of The Institutional Ethics committee was obtained. The study didn't impose any financial burden on the parents or guardians of the study group and an informed written consent was taken from the parents/guardians of the participants before conducting the study. The study was not funded by any agency.

All patients qualified as per the inclusion criteria were evaluated and interviewed as per the proforma. Detailed history was taken including presence of associated symptoms, history of birth asphyxia, family history of seizures, presence of low socioeconomic status (as per the modified kuppusswamy scale 2021 score less than 10), and dietary pattern of individual. Further complete clinical examination was done and cases were classified under International league against epilepsy 2017 Classification.

Clinical investigations of Complete blood count, Random blood sugar, Serum Calcium, Serum Magnesium, Urea and Creatinine, Liver function test, Serum electrolytes (Na⁺, K⁺, Cl⁻), Neuro imaging (M.R.I. / C.T. Scan), Electroencephalogram were collected.

Etiological diagnosis was based on history, clinical examination, and relevant investigations. If etiology were not determined and all investigations apart from electroencephalography were normal then these patients were labelled as Seizures with unknown etiology.

Statistical Analysis

The data were analyzed by specific statistical method applicable to the various sets of data. All the statistical methods were performed through SPSS for windows version 20, p value of < 0.05 was considered statistically significant. Microsoft word and Excel was used to generate graphs and table. All data of various groups were tabulated and statistically analyzed using suitable statistical tests. Mean difference between the continuous data was analysed using t-test and the categorical data using the chi-square test.

OBSERVATIONS AND RESULTS

Table 1: Demographic Variable Accounted In Study

Sr. No.	Demographic variable	n (%)
1	Age group	
	1 month – 5 months	3 (6%)
	6 month – 5 years	21 (42%)
	6 year – 12 years	19 (38%)
	13 year – 18 years	7 (14%)
2	Gender	
	Male	30 (60%)
	Female	20 (40%)
3	Associated symptoms	
	Present	24 (48%)
	Not present	26 (52%)
4	Family history of seizures	
	Present	12 (24%)
	Not present	38 (76%)
5	History of birth asphyxia	
	Present	5 (10%)
	Not present	45 (90%)
6	Low socioeconomic status	
	Present	29 (58%)
	Not present	21 (42%)
7	Dietary pattern	
	On breastfeeding	3 (6%)
	Vegetarian	32 (64%)
	Non-vegetarian	15 (30%)
8	CSF findings	
	Not significant	1 (2%)
	Significant	11 (22%)
	Not done	38 (76%)
9	Neuroimaging	
	Normal	27 (54%)
	Abnormal	15 (30%)
	Not done	8 (16%)
10	EEG pattern	
	Normal	6 (12%)
	Abnormal	22 (44%)
	Not done	22 (44%)
11	Clinical diagnosis	
	Generalized tonic clonic	24 (48%)
	Tonic	8 (16%)
	Myoclonic	2 (4%)
	Absence	2 (4%)
	Focal onset- Aware	1 (2%)
	Focal onset- impaired	8 (16%)
	Others	5 (10%)

12	Etiological diagnosis	
	CNS infection	12 (24%)
	Febrile seizures	6 (12%)
	I.C.S.O.L.	8 (16%)
	Metabolic derangements	3 (6%)
	Seizure with unknown etiology	16 (32%)
	Others	5 (10%)

Table 2: Comparison Of The Etiological Diagnosis With Low Socioeconomic Status Of Patients

		Low Socioeconomic status				Chi-square (p-value)
		Not present		Present		
		Count	Column N %	Count	Column N %	
Etiological diagnosis	CNS Infections	2	9.5%	10	34.5%	13.191 (0.02)*
	Febrile seizures	2	9.5%	4	13.8%	
	I.C.S.O.L.	2	9.5%	6	20.7%	
	Metabolic derangements	2	9.5%	1	3.4%	
	Others	1	4.8%	4	13.8%	
	Seizure with unknown etiology	12	57.1%	4	13.8%	

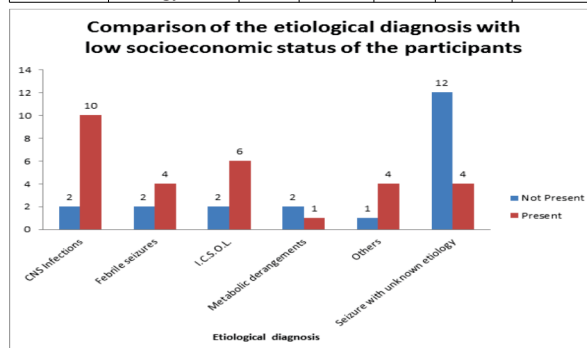


Figure 1: Comparison Of The Etiological Diagnosis With Low Socioeconomic Status Of Patients

Table 3: Comparison Of The Etiological Diagnosis With Age Group Of Patients

		Age group								Chi-square test (p-value)
		1 month - 5 month		6 month - 5 year		6 year - 12 year		13 year - 18 year		
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	
Etiological diagnoses	CNS Infections	1	33.3 %	3	14.3 %	5	26.3 %	3	42.9 %	39.761 (0.001)*
	Febrile seizures	0	0.0 %	5	23.8 %	1	5.3 %	0	0.0 %	
	I.C.S.O.L .	0	0.0 %	1	4.8 %	6	31.6 %	1	14.3 %	
	Metabolic derangements	2	66.7 %	1	4.8 %	0	0.0 %	0	0.0 %	
	Seizure with unknown etiology	0	0.0 %	6	28.6 %	7	36.8 %	3	42.9 %	
	Others	0	0.0 %	5	23.8 %	0	0.0 %	0	0.0 %	

TABLE 1- According to the data collected in this study out of total of 50 subjects' majority was in age group of 6 month-5 years (42%), followed by 38% in 6 year-12 years of age, 14% in 13 year-18 year of age and 6% in 1 month-5 year of age. In gender variable 60% were male and 40% were female showing marginal male preponderance in the study. The associated symptoms were present in 48% of the participants, amongst which fever was predominant associated complaint followed by vomiting and headache. For all the participants

low socioeconomic status was classified as per Modified kuppuswamy scale (2021) score less than 10, and in our study, it was seen in 58% of the patients. The clinical diagnosis showed the most common as the generalized tonic clonic seizures in 48%, followed with 16% each with tonic and focal onset impaired type and 10% with others (8% clonic and 2% atonic), 4% with each myoclonic and absence while focal onset aware was seen in 2%. On etiological diagnosis, the study found 32% with seizure with unknown etiology, 24% with CNS infection, 16% with ICSOL (12% NCC, 2% Pontine glioma 2% Subarachnoid haemorrhage) 12% with febrile seizures, 10% with others (6% with HIE sequelae, 2% with hypertensive encephalopathy, 2% with head injury) and 6% with metabolic derangements (all cases attributing to hypocalcemia) in the patients

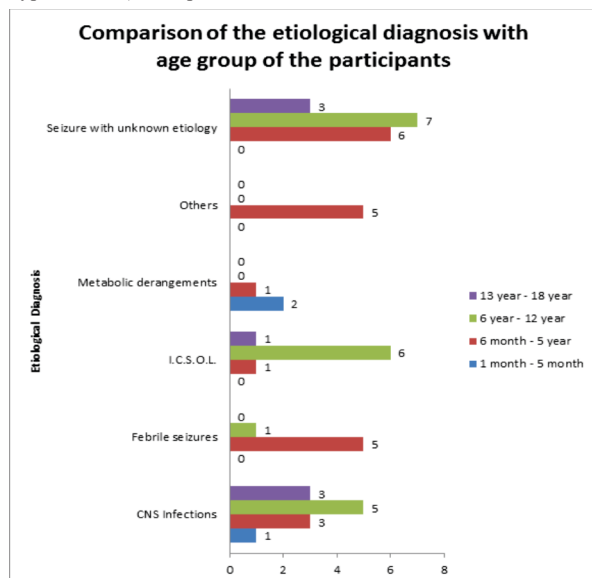


Figure 2: Comparison Of The Etiological Diagnosis With Age Group Of Patients

TABLE 2 & FIGURE 1- On comparison of the etiological diagnosis between the low socioeconomic status, there was significant difference observed, which showed higher incidence of CNS infections among the patients with low Socioeconomic status ($p < 0.05$).

TABLE 3 & FIGURE 2- There is significant relation of the etiological diagnosis with the age group of the patients included in the study. CNS infections were common in 1-5m, and 13-18yrs of age groups, whereas I.C.S.O.L. was common in 6yr-12yrs age group, metabolic derangements were common in 1-5m age group (66.7%) and seizure with unknown etiology in children in the age group of 6m to 18yrs. ($p < 0.05$).

DISCUSSION

In our study, total of 50 patients fulfilling inclusion criteria are enrolled. Major incidence of new onset seizures was found in the age group of 6month-5years (42%) followed by age group of 6yr-12yr (38%). This incidence was similar in a study by Adhikari S et al.⁴ where majority (57.5%) of the patients are in age group of 6 month-5 years. On the contrary in a study by Kumar PL et al.¹ shows highest incidence (40.5%) in an age group of 11 years-15years.

Among the comprised patients in this study, 60% were male and 40% were female, conveying male preponderance in this study. In a parallel study by Kumar PL et al.¹ male dominance (54.8%) over female (45.2%) was revealed. While in study by Dwivedi R et al.⁵ Male: Female ratio was 1.04:1.

In primary study, associated symptoms were present in 48% of the patients, amongst which fever was predominant associated complaint followed by vomiting and headache. In a study by Kumar PL et al.¹ fever was a major associated symptom with seizures and was present in 80 subjects (63.5%) out of 126. Alike observations were seen in study by Singh RD et al.⁶

24% of patients in our study had family history of seizures, Redda Tekle-Haimanot et al.⁷ noted 22% patient with family history of

seizures. In our study, parameters like birth asphyxia, socioeconomic status and dietary patterns were taken into account and it was discovered that, 58% of participants belong to lower socioeconomic status as per modified kuppuswamy scale (2021)⁸. Ten percent of study participants had history of birth asphyxia. Dietary patterns were observed, with 64% of participants being vegetarian, 30% non-vegetarian, and 6% on exclusive breastfeeding.

In this study lumbar puncture was performed and CSF samples withdrawn in 12 (24%) patients, out of which 11 patients had significant finding in report and 1 patient had insignificant report. Adhikari S et al.⁴ documents lumbar puncture procedure in 317 (57.5%) patients and abnormal reports were found in 82 patients.

Imaging of brain plays an incredible role in patients of seizures to identify etiology but it is not indicated on routine basis.⁹ In our study brain imaging is done in 42 (84%) cases, among which 27 patients had normal neuro imaging and 15 patients had abnormal neuroimaging. While in Study by Adhikari S et al.⁴ brain imaging was done in 242 (43.9%) study population and further they documented brain imaging abnormality in 111 subjects (45.9%), with neurocysticercosis being the most common abnormality [66 (59.4%)].

In index study 28 subjects underwent EEG with abnormal findings in 22 and normal findings in 6, which suggest that in subjects who underwent EEG, 78.57% had abnormal reports and 21.43% had normal reports. In concordance to our study Kumar PL et al.¹ described 82.9% abnormal EEG reports and 17.1% with normal EEG reports in their study.

In our study, the most common clinical diagnosis was generalised tonic clonic seizures (48%), followed by 16% with each tonic and focal onset impaired type, 10% with others (8% clonic and 2% atonic), 4% with each myoclonic and absence seizures and 2% in focal onset aware. Similar consensus documented by Ramesh et al.¹⁰ in their study, among 120 participants predominant type of seizure being GTCS (in 98 children) and Focal seizures in remaining (22 children). Similitude of predominance of generalised tonic-clonic seizures (69.9%) was remarked in study done by Adhikari S et al.⁴

On etiological diagnosis, primary study found majority of patient with seizure with unknown etiology, contributing to 32% of study population, followed by 24% with CNS infection, 16% with I.C.S.O.L., 12% with febrile seizures, 10% with others (6% with HIE sequelae, 2% with hypertensive encephalopathy, 2% with head injury) and 6% with metabolic derangements (all cases attributed to hypocalcemia). Adhikari S et al.⁴ in their study showed overall most common etiologies as seizure disorder (33.6%), febrile seizures (30.5%), neurocysticercosis (12%), encephalitis (6.7%) and meningitis (6.5%). However Febrile seizures were leading etiology in studies by Chen CY et al.³ (62.1%), Kumar R et al.¹¹ (36%), Mwipopo EE et al.¹² (87.5%) and Ojha AR et al.¹³

In current study, on comparison of the etiological diagnosis with low socioeconomic status, there was significant difference, higher incidence of CNS infections was witnessed among the patients with low Socioeconomic status. ($p < 0.05$). Omoleke et al.,¹⁴ orchestrated a study in local governmental areas of aliero and juga in Kebbi state of north western Nigeria and in commonality to our study, they distinctly remarked role of poor economic condition as a risk factor for recurrent epidemic meningitis.

There is significant relation of the etiological diagnosis with the age group of the patients included in our study. CNS infections were common in 1-5month, and 13-18years of age, I.C.S.O.L. was common in 6yr-12yrs age, metabolic derangements were common in 1-5month age (66.7%) and seizure with unknown etiology in children more than 13 to 18yrs. ($p < 0.05$). While in study of Dwivedi et al.⁶ in both age groups (3-5 years & 6-12 years) most common cause (73/98) was intracranial infections, which included neurotuberculosis (Tuberculoma/T.B. meningitis) (26/73), NCC (20), bacterial meningitis (12), cerebral malaria (8), and viral encephalitis (7) while lesions occupying space were more common in children aged 6-12 years (46.8%) than in children aged 3-5 years (19.6%).

CONCLUSION

New onset seizure in a previously well children are distressful for parents, as it affects quality of life of child and sometimes it is

associated with poor neurodevelopmental outcome. In this study, first seizure was noticed remarkably common in the age group of 6month-12years and in nearly one fourth cases of new onset seizures had family history of seizures. Clinically generalized tonic clonic was the most common type of seizure. In etiological diagnosis CNS infections formed one of the major proportions among study participants and cases of neurocysticercosis, pontine glioma and subarachnoid haemorrhage were space occupying lesions found on neuroimaging. For effective diagnosis, proper clinical assessment, relevant blood investigations are required and sometimes neuroimaging, CSF analysis and EEG also required for diagnosis.

We observed that there is high incidence of CNS infections among patients of low Socioeconomic status. So, preventive measures at household and community level are essential to reduce incidence of CNS infections.

Limitations

On contemplating limitation of this study, small sample size limits the external validity of study results. Study was performed in a single tertiary care centre. Therefore, multi-centric longitudinal studies showing future neuro developmental outcome with large sample size are required to overcome these limitations.

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