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Original Research Article

A Retrospective Study of Clinical Characteristics of Epilepsy in Children

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Abstract:

Background: Pediatric epilepsy is a common neurological disorder with diverse clinical presentations and significant impact on quality of life.

Aim: To evaluate the clinical characteristics, etiology, and treatment outcomes of epilepsy in children.

Methodology: A retrospective observational study was conducted in the Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. A total of 90 children (<18 years) diagnosed with epilepsy were included. Data were collected from medical records and analyzed using descriptive statistics.

Results: The majority of patients were aged 1–5 years (37.8%) with male predominance (57.8%). Generalized seizures were most common (62.2%), and onset was highest in early childhood (42.2%). Most patients experienced 2–4 seizures/month (40%), with duration <5 minutes (55.6%). Idiopathic etiology predominated (46.7%), followed by structural (24.4%) and infectious causes (17.8%). Monotherapy was used in 64.4% cases. However, only 44.4% achieved well-controlled seizures, while 55.6% had partial or poor control.

Conclusion: Pediatric epilepsy commonly presents in early childhood with generalized seizures and idiopathic etiology. Despite treatment, a significant proportion shows suboptimal control, highlighting the need for improved management strategies.

Keywords: Pediatric Epilepsy, Seizure Type, Clinical Characteristics, Etiology, Treatment Outcome.

Introduction

Epilepsy stands as a major global health issue because it exists as one of `the most common chronic neurological diseases that occurs throughout the world and it causes severe declines in patient life quality especially among children [1]. The condition shows a tendency to produce continuous spontaneous seizures which emerge due to irregular brain electrical patterns. The annual incidence of epilepsy shows that children make up the largest portion of all age groups with a rate of 41 to 187 cases per 100000 population which exceeds the adult rate. The incidence rate in China shows a regional difference which has reached a maximum of 151 cases per 100000 children in that country. The study of epilepsy in children demonstrates critical importance because the research sheds light on the condition's clinical pattern and the ways it develops over time and its eventual results.

The etiology of epilepsy in children shows multiple causes which create a complex pattern of medical conditions. Current classification systems state that seizures emerge from four different sources which include genetic factors, structural abnormalities, metabolic disorders and unidentified origins [2]. Genetic causes involve inherited or de novo mutations which disrupt neuronal excitability, while structural causes include cortical malformations and brain tumors and injury-related brain abnormalities. Metabolic disorders arise from biochemical disturbances, yet many cases remain unsolved after thorough investigation. The different causes of epilepsy lead to different patterns of clinical symptoms and

treatment outcomes which create difficulties for doctors who treat this condition in children.

The main approach for epilepsy treatment still depends on medication which uses antiepileptic drugs (AEDs) as its primary treatment method. Approximately 70% of patients who receive appropriate AED therapy achieve successful seizure control which may lead them to become seizure-free. Medical treatment reaches its highest efficiency yet 20% to 30% of patients still experience ongoing seizures which remain uncontrollable [3]. These cases are classified as drug-resistant epilepsy (DRE), a condition defined by the International League Against Epilepsy (ILAE) as the failure of adequate trials of two well-tolerated and appropriately selected AED regimens, whether used alone or in combination, to achieve sustained seizure freedom [4]. DRE brings significant difficulties for treatment because it leads to higher rates of disability and cognitive decline and social functioning problems among children.

Surgical treatment has become a vital medical procedure for pediatric patients who suffer from drug-resistant epilepsy because it provides an effective solution to their condition. The surgical procedure aims to eliminate or sever the epileptic brain area which causes seizures. Histopathological studies have demonstrated that the most common underlying causes of DRE in children include cortical malformations and brain tumors which differ from adult patients who primarily suffer from hippocampal sclerosis. This distinction shows that different age groups require their own specific methods for assessing and treating epilepsy. Although resective surgery provides successful treatment results, not all patients can undergo the procedure because they have brain regions that control vital functions or they have widespread brain damage [5].

Patients who cannot undergo resective surgery need to receive alternative palliative surgical treatments which have existed as standard practice throughout medical history. Techniques such as multiple subpial transections (MST) and corpus callosotomy have been used to reduce seizure frequency by limiting the spread of epileptiform activity [6]. The field of neuroscience and medical technology has produced numerous new neuromodulation therapies which include both vagus nerve stimulation and various emerging treatment methods to treat patients who have refractory epilepsy. The selected intervention aims to achieve two main objectives which include decreasing both seizure occurrences and seizure intensity to enhance patient life quality.

The condition of epilepsy affects children as both a neurological disorder and a condition that results in serious developmental and psychosocial effects [7]. The occurrence of severe and uncontrolled seizures during early life stages leads to cognitive decline and developmental delays. The ILAE organization does not accept catastrophic epilepsy as a formal clinical classification, but the term used to describe such cases existed in past medical practice. The presence of frequent and severe seizures affects a child's daily activities, which include their ability to learn and interact with others. The difficulties that arise from these situations impact not just the individual patient but also their family members while they create major challenges for the healthcare system.

The public health problem of drug-resistant epilepsy exists because it leads to developmental issues and requires more medical treatment. The solution to these cases needs a team of specialists who will work together to provide medical care and surgical procedures and supportive treatments. The medical field still faces a major challenge because doctors cannot achieve perfect seizure management while reducing negative side effects of existing treatments.

The study of epilepsy in children requires retrospective studies as essential research methods for their scientific advancement. The research study evaluates clinical characteristics together with presentation patterns and treatment results to deliver clinical insights which will shape upcoming research endeavors. The present study investigates clinical characteristics of childhood epilepsy through a retrospective study to enhance understanding of this complex disorder.

Methodology

Study Design: This study was designed as a retrospective observational study aimed at evaluating the clinical characteristics of epilepsy in pediatric patients. The retrospective nature of the study involved reviewing previously recorded medical data of children diagnosed with epilepsy.

Study Area: The study was conducted in the Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.

Study Duration: The study was carried out over a period of 7 months from March 2025 to September 2025.

Study Participants

Inclusion Criteria

- Children aged below 18 years diagnosed with epilepsy
- Patients who attended the pediatric department during the study period
- Patients with complete and accessible medical records
- Patients with a confirmed diagnosis based on clinical evaluation

Exclusion Criteria

- Patients with incomplete or missing medical records

- Patients with seizures due to acute metabolic disturbances or infections
- Patients with febrile seizures only
- Patients who were lost to follow-up or had insufficient clinical data

Sample Size: A total of 90 pediatric patients diagnosed with epilepsy who fulfilled the eligibility criteria were included in the study.

Procedure: Data for the study were collected retrospectively from hospital records and medical case files of pediatric patients diagnosed with epilepsy. A structured data extraction form was used to collect relevant information including demographic details (age, gender), clinical characteristics (type of seizures, age at onset, frequency of seizures), family history, associated comorbidities, and treatment details such as type of antiepileptic drugs used and response to therapy. Prior to data collection, necessary permission was obtained from the hospital authorities. The collected data were carefully reviewed for completeness and accuracy. Patient confidentiality was strictly maintained by excluding personal identifiers. The study focused on analyzing patterns of epilepsy presentation and clinical features in children attending the pediatric department. No direct patient interaction was involved as the study relied solely on previously recorded data. Data collectors were trained to ensure uniformity in data extraction and to minimize errors during the collection process.

Statistical Analysis: The collected data were entered into Microsoft Excel and subsequently analyzed using Statistical Package for Social Sciences (SPSS) version 27.0. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize the data. Inferential statistical tests were applied where appropriate to assess associations between variables. A p-value of less than 0.05 was considered statistically significant. The results were presented in the form of tables and charts for clear interpretation.

Result

Table 1 presents the demographic characteristics of the study participants (n = 90). The age-wise distribution shows that the highest proportion of participants belonged to the 1–5 years age group, comprising 34 children (37.8%), followed by 6–10 years with 26 participants (28.9%). Adolescents aged 11–18 years accounted for 18 cases (20%), while infants less than 1 year constituted the smallest group with 12 participants (13.3%). Regarding gender distribution, males were more prevalent, with 52 participants (57.8%), compared to 38 females (42.2%). Overall, the study population was predominantly composed of younger children, particularly in the 1–5 years age group, with a higher representation of males than females.

Table 1: Demographic Characteristics of Study Participants (n = 90)

Variable	Category	Number (n)	Percentage (%)
Age Group (years)	<1 year	12	13.3
	1–5 years	34	37.8
	6–10 years	26	28.9
	11–18 years	18	20
Gender	Male	52	57.8
	Female	38	42.2

Table 2 presents the clinical characteristics of epilepsy among the study population (n = 90). The majority of patients exhibited generalized seizures, accounting for 56 cases (62.2%), followed by focal seizures in 24 patients (26.7%), while 10 cases (11.1%) were classified as unknown or unclassified. Regarding the age at onset, the highest proportion of cases was observed in children aged 1–5 years, comprising 38 patients (42.2%). This was followed by those with onset after 5 years of age, accounting for 32 cases (35.6%), whereas 20 patients (22.2%) experienced seizure onset before the age of 1 year. These findings indicate that generalized seizures are the most prevalent type and that epilepsy most commonly begins in early childhood within the study population.

Table 2: Clinical Characteristics of Epilepsy (n = 90)

Variable	Category	Number (n)	Percentage (%)
Type of Seizure	Generalized seizures	56	62.2
	Focal seizures	24	26.7
	Unknown/Unclassified	10	11.1
Age at Onset	<1 year	20	22.2
	1–5 years	38	42.2
	>5 years	32	35.6

Table 3 presents the frequency and duration of seizures among the study participants (n = 90). The majority of patients experienced seizures at a frequency of 2–4 episodes per month, accounting for 36 cases (40%), followed by those with ≤1 episode per month comprising 28 patients (31.1%). A considerable proportion, 26 patients (28.9%), reported more than 4 episodes per month, indicating a notable burden of frequent seizures. Regarding the duration of seizures, more than half of the patients, 50 (55.6%), experienced seizures lasting less than 5 minutes, while 28 patients (31.1%) had seizures lasting between 5–10 minutes. A smaller proportion, 12 patients (13.3%), experienced prolonged seizures of more than 10 minutes. Overall, the findings suggest that while most seizures were short in duration, a significant number of patients had relatively frequent episodes.

Table 3: Frequency and Duration of Seizures (n = 90)			
Variable	**Category**	**Number (n)**	**Percentage (%)**
Seizure Frequency (last 6 months)	≤1 episode/month	28	31.1
	2–4 episodes/month	36	40
	>4 episodes/month	26	28.9
Duration of Seizure	<5 minutes	50	55.6
	5–10 minutes	28	31.1
	>10 minutes	12	13.3

Table 4 presents the distribution of etiology and associated factors among the study participants (n = 90). The majority of cases were classified as idiopathic, accounting for 42 patients (46.7%), indicating that nearly half of the epilepsy cases had no identifiable cause. Structural etiology was observed in 22 cases (24.4%), while infectious causes contributed to 16 cases (17.8%). Genetic etiology was the least common, reported in 10 patients (11.1%). Regarding family history of epilepsy, 18 patients (20%) had a positive family history, whereas a significant majority of 72 patients (80%) had no such history. These findings suggest that idiopathic epilepsy predominates in the study population, with a relatively lower contribution of genetic and infectious causes, and limited familial association in most cases.

Table 4: Etiology and Associated Factors (n = 90)			
Variable	**Category**	**Number (n)**	**Percentage (%)**
Etiology	Idiopathic	42	46.7
	Structural	22	24.4
	Genetic	10	11.1
	Infectious	16	17.8
Family History of Epilepsy	Present	18	20
	Absent	72	80

Table 5 presents the treatment pattern and outcomes among 90 pediatric patients with epilepsy. The majority of patients were managed with monotherapy, accounting for 58 cases (64.4%), while 32 patients (35.6%) required polytherapy, indicating that a considerable proportion needed multiple drugs for seizure control. Regarding treatment outcomes, 40 patients (44.4%) achieved well-controlled seizures, representing the largest group. However, 28 patients (31.1%) were only partially controlled, and 22 patients (24.5%) remained poorly controlled despite treatment. These findings suggest that although monotherapy was effective for a majority of patients, a significant proportion still experienced suboptimal seizure control, highlighting the need for individualized and possibly more aggressive treatment strategies in certain cases.

Table 5: Treatment Pattern and Outcome (n = 90)			
Variable	**Category**	**Number (n)**	**Percentage (%)**
Type of Treatment	Monotherapy	58	64.4
	Polytherapy	32	35.6
Treatment Outcome	Well-controlled	40	44.4
	Partially controlled	28	31.1
	Poorly controlled	22	24.5

Discussion

The current research examines pediatric epilepsy through its demographic and clinical features which show both matching elements and differing elements with established research. The study found that early childhood onset accounted for 37.8% of

cases in the 1-5 years age group while 42.2% of cases experienced seizure onset during this period which matches previous studies that identified childhood as the primary epilepsy onset period. Moshe et al. (2015) [8] reported that early childhood shows the highest epilepsy incidence because developing brains face increased vulnerability during this period. Bharucha (2012) [9] conducted epidemiological research in India which found that younger age groups had higher epilepsy rates than older age groups thus supporting our current results. The study found that 22.2% of infants participated in our research which shows a lower percentage than other studies that report higher infantile onset rates because of varying referral patterns and diagnostic capacity between studies.

The study found that there were more male participants who accounted for 57.8% of the total sample, which confirms the findings that Almu et al. (2006) [10] reported about higher rates of epilepsy in males. The combination of biological susceptibility together with sociocultural factors that determine healthcare access creates this situation. The research demonstrated that some studies found no gender difference because different populations showed different patterns of gender distribution.

The study found that generalized seizures occurred most frequently among seizure types because they accounted for 62.2% of the total cases. The study results show that Chen et al. (2018) [11] found that generalized epilepsy emerged as the dominant diagnosis for new patients who entered their study. The existence of this pattern shows that pediatric patients throughout the world present with consistent seizure patterns. The study results show that our research identified 26.7% of focal seizures while Western studies reported higher percentages because they used different diagnostic methods that included EEG and neuroimaging to identify focal epilepsies.

The study results show that 40% of participants experienced monthly seizure rates between 2 and 4 seizures while 28.9% experienced more than four seizure events which demonstrates a substantial active epilepsy burden. The research produces results that match the findings of Niriayo et al. (2018) [12] who discovered that a significant number of patients experienced frequent seizures before they could achieve seizure control. The occurrence of extended seizures lasting more than 10 minutes in 13.3% of patients demonstrates that this situation presents a serious medical threat which Berg et al. (1996) [13] identified as a factor that leads to permanent epilepsy. The study results demonstrate that doctors need to recognize seizures that occur with high frequency and last for extended periods so they can provide effective treatment to their patients.

The study shows that 46.7% of idiopathic cases represent the main cause of epilepsy because research studies throughout the world show that most pediatric epilepsy cases remain without an evident cause. The research by Groenewegen et al. (2014) [14] found that idiopathic epilepsy represented one of the main types of epilepsy present in their study population. The research found that structural causes contributed 24.4% of cases while infectious causes made up 17.8% of cases which shows that developing countries continue to experience a public health problem that brings about avoidable illnesses. Cannizzaro (2022) [15] showed that low- and middle-income countries experience higher rates of infection-related neurological disorders compared to other regions. The study found that 11.1% of cases identified genetic causes because research studies show that advanced genetic testing remains inaccessible to patients.

The current study discovered that 64.4% of patients received monotherapy as their treatment method which corresponds to the findings of Chen et al. (2018) who demonstrated that initial monotherapy had 63.7% success rate. Yet this percentage exceeds the 50% benchmark established by Groenewegen et al. (2014) international studies while Niriayo et al. (2018) reported a 46.6% rate [16]. The difference exists because researchers employed different sample sizes and study groups and they followed different research procedures. The study results show that 35.6% of cases required polytherapy which demonstrates that refractory epilepsy affected a significant portion of the group, which aligns with the research findings of Obiako et al. (2014) [17] who studied complex cases that needed multiple drug regimens.

Only 44.4 percent of patients reached seizure control while 31.1 percent had partial control and 24.5 percent showed poor control of their seizures. The results demonstrate a moderate achievement level which falls short of the success rate reported by Chen et al. (2018) because a larger number of patients reached seizure freedom during their extended follow-up period. The difference between the two studies results from three main factors which include shorter follow-up periods, healthcare system differences, and variations in how patients followed their treatment plans. Research studies have established that patient adherence acts as a vital element which determines the outcome of medical treatments; both Niriayo et al. (2018) and Obiako et al. (2014) found that patients who followed their treatment plan achieved better seizure control results. The study did not measure adherence directly but the rate of poorly controlled cases indicates that three factors which include drug access and patient compliance and socioeconomic status probably affected patient results.

The study results demonstrate their main agreement with existing research but show particular regional differences. The higher burden of infectious and structural causes together with moderate treatment

success rates and polytherapy use by patients demonstrate the need to improve diagnostic facilities and early intervention methods and healthcare system development. The study results show that global pediatric epilepsy patterns maintain their consistency while local factors determine how the condition presents itself and which treatment methods succeed.

Conclusion

The present study highlights that pediatric epilepsy predominantly affects younger children, particularly those aged 1–5 years, with a higher prevalence among males. Generalized seizures were the most common type, and the majority of cases had onset in early childhood. Although most seizures were brief in duration, a considerable proportion of patients experienced frequent episodes, indicating a significant disease burden. Idiopathic etiology was most prevalent, though structural and infectious causes also contributed notably. While monotherapy was effective for many patients, a substantial number required polytherapy and continued to have partially or poorly controlled seizures. These findings emphasize the need for early diagnosis, improved management strategies, and individualized treatment approaches to enhance seizure control and overall outcomes in pediatric epilepsy.

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