Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/9719vb71

CLINICAL PROFILE AND MANAGEMENT OUTCOMES OF PEDIATRIC SEIZURE DISORDERS: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

Dr. Pradeep Kumar Jain[1*]

[1*]Assistant Professor, Department of Pediatrics, Saraswati Institute of Medical Sciences Hapur, Uttar Pradesh drpradeepjain70@gmail.com

***Corresponding Author:** Dr. Pradeep Kumar Jain
*Assistant Professor, Department of Pediatrics, Saraswati Institute of Medical Sciences Hapur, Uttar Pradesh drpradeepjain70@gmail.com

Accepted: 12 January 2010 Published: 11 February 2010

Abstract

Introduction: Pediatric seizure disorders represent a significant neurological condition affecting 4-10% of children globally, with varying clinical presentations and etiological patterns across different populations. This study aimed to evaluate the clinical profile, demographic characteristics, and management outcomes of pediatric seizure disorders in a tertiary care hospital setting in North India.

Methods: A hospital-based descriptive cross-sectional study was conducted at Saraswati institute of medical sciences hapur, from July to December 2009. Children aged 1 month to 12 years admitted with seizure disorders were enrolled using consecutive sampling. Data were collected using structured questionnaires covering demographic details, clinical presentations, seizure characteristics, etiological factors, and treatment outcomes. Statistical analysis was performed using SPSS version 15.0.

Results: Among 215 children studied, 61.4% were under 2 years of age with male predominance (57.7%) and rural residence (72.6%). Generalized tonic-clonic seizures were most common (66.0%), followed by febrile seizures (17.7%). Fever-related etiologies predominated (41.4%), with idiopathic causes in 26.0% and CNS infections in 15.8% of cases. Associated fever was present in 57.7% of patients, with developmental delay noted in 20.9%. Complete seizure control was achieved in 77.7% of cases, with mortality of 3.7% and 19.1% lost to follow-up.

Conclusion: Pediatric seizure disorders predominantly affected infants and young children from rural, lower socioeconomic backgrounds. The high prevalence of fever-related and infectious etiologies emphasizes the need for enhanced infection prevention strategies and improved emergency care protocols in similar healthcare settings.

Keywords: pediatric seizures, epilepsy, febrile seizures, hospital-based study, clinical profile

Introduction

Seizure disorders represent one of the most common and significant neurological conditions affecting children worldwide, constituting a major cause of pediatric hospital admissions and emergency department visits. Pediatric seizures encompass a broad spectrum of disorders, ranging from benign febrile seizures to complex epileptic syndromes, each with distinct clinical

presentations, etiologies, and long-term implications for child development and quality of life. The epidemiological landscape of pediatric seizure disorders reveals compelling statistics that underscore their public health significance, with seizures affecting approximately 4-10% of children before the age of 16 years, making them among the most frequently encountered neurological problems in pediatric practice (Cowan, 2002).

The incidence and prevalence of seizure disorders in children demonstrate considerable variation across different populations and geographic regions, with developing countries reporting higher rates compared to developed nations. Population-based studies have consistently shown that the incidence of epilepsy in children ranges from 41-187 per 100,000, with the highest rates observed in rural areas of underdeveloped countries where access to healthcare services and preventive interventions may be limited (Camfield et al., 2015). The age-specific distribution of seizure disorders reveals particularly elevated incidence rates during the neonatal period and early infancy, with approximately 1.5% of neonates experiencing seizures, while febrile seizures affect 2-4% of young children, and epilepsy develops in up to 1% of children and adolescents (Berg, 2013).

In the Indian context, pediatric seizure disorders present unique epidemiological characteristics that reflect the complex interplay of genetic, environmental, and socioeconomic factors. Indian studies have documented epilepsy prevalence rates comparable to developed nations, yet the etiological spectrum shows distinct patterns with neurocysticercosis emerging as a predominant cause of symptomatic epilepsy in children (Udani, 2005). The burden of pediatric seizure disorders in India is further compounded by significant treatment gaps, with a substantial proportion of affected children lacking access to appropriate medical care and antiepileptic medications. Regional variations in seizure prevalence and etiology within India highlight the need for localized research to inform evidence-based clinical practice and public health interventions.

The clinical spectrum of pediatric seizure disorders encompasses diverse manifestations that present diagnostic and therapeutic challenges for healthcare providers. Neonatal seizures, occurring in the immediate postnatal period, represent the earliest form of seizure disorders and often serve as markers of serious underlying neurological conditions, including hypoxic-ischemic encephalopathy, intracranial infections, metabolic disturbances, and congenital malformations (Ronen et al., 2007). The recognition and management of neonatal seizures require specialized expertise due to their unique clinical features, which may differ significantly from seizures in older children, and their potential for causing long-term neurodevelopmental sequelae.

Febrile seizures constitute the most common type of seizure disorder in children, typically occurring between 6 months and 5 years of age during febrile illnesses. While generally considered benign with excellent long-term prognosis, febrile seizures generate significant parental anxiety and healthcare utilization, necessitating careful evaluation to exclude serious underlying conditions such as meningitis or encephalitis (Millichap & Millichap, 2006). The classification of febrile seizures into simple and complex categories based on duration, focal features, and recurrence patterns has important implications for diagnostic evaluation and prognosis, with complex febrile seizures carrying a slightly higher risk for subsequent development of epilepsy.

Epilepsy in children represents a chronic neurological condition characterized by recurrent unprovoked seizures, affecting approximately 0.5-1% of the pediatric population. The etiological classification of childhood epilepsy has evolved significantly with advances in neuroimaging, genetic testing, and understanding of epileptic syndromes. Symptomatic epilepsy, resulting from identifiable brain lesions or metabolic disorders, accounts for a substantial proportion of cases in developing countries, where prenatal and perinatal complications, central nervous system infections, and traumatic brain injuries are more prevalent (Singh et al., 2006).

The impact of pediatric seizure disorders extends beyond immediate clinical manifestations to encompass long-term neurodevelopmental, cognitive, and psychosocial consequences. Children with epilepsy demonstrate higher rates of learning disabilities, attention-deficit hyperactivity disorder, and behavioral problems compared to their neurotypical peers. Approximately 20-25% of children with epilepsy experience significant intellectual impairment, while a substantial minority face challenges with academic achievement and social integration (Datta et al., 2006). These

comorbidities significantly influence quality of life for affected children and their families, highlighting the importance of comprehensive care approaches that address both seizure control and associated developmental needs.

The diagnostic evaluation of children with seizure disorders has been revolutionized by advances in neuroimaging, electroencephalography, and genetic testing. Neuroimaging studies, particularly magnetic resonance imaging, play a crucial role in identifying structural brain abnormalities that may underlie seizure disorders, including cortical malformations, mesial temporal sclerosis, and space-occupying lesions. Electroencephalography remains the cornerstone of seizure diagnosis and epilepsy syndrome classification, providing essential information about seizure localization, frequency, and response to treatment interventions.

Prevention strategies for pediatric seizure disorders focus on addressing modifiable risk factors during prenatal, perinatal, and postnatal periods. Adequate prenatal care, prevention of birth complications, prompt treatment of neonatal hypoglycemia and infections, immunization programs, and injury prevention measures can significantly reduce the incidence of symptomatic seizure disorders. Public health initiatives aimed at improving nutrition, reducing infectious disease burden, and enhancing access to healthcare services are particularly important in developing countries where preventable causes of epilepsy remain prevalent.

The socioeconomic burden of pediatric seizure disorders encompasses direct medical costs, indirect costs related to lost productivity and caregiver burden, and intangible costs associated with reduced quality of life. Families of children with epilepsy often face significant financial challenges related to medical expenses, specialized care needs, and reduced earning capacity. The stigma associated with seizure disorders in many cultures further compounds these challenges, leading to social isolation and discrimination that can persist into adulthood.

Healthcare system considerations for pediatric seizure disorders include the need for specialized pediatric neurology services, emergency department protocols for seizure management, and comprehensive care coordination across multiple healthcare providers. The training of healthcare personnel in seizure recognition, emergency management, and long-term care principles is essential for optimizing outcomes in children with seizure disorders. Quality improvement initiatives focusing on standardized care protocols, outcome monitoring, and evidence-based practice implementation can enhance the overall quality of care provided to affected children and families.

Research priorities in pediatric seizure disorders continue to evolve with advances in neuroscience, genetics, and therapeutic interventions. Areas of active investigation include the development of novel antiepileptic medications with improved efficacy and safety profiles, precision medicine approaches based on genetic markers, neuroprotective strategies for preventing epileptogenesis, and innovative surgical techniques for drug-resistant epilepsy. Biomarker research aimed at identifying predictors of treatment response and long-term prognosis holds promise for personalizing care approaches and improving outcomes for children with seizure disorders.

This study aimed to evaluate the clinical profile, etiological spectrum, and demographic characteristics of pediatric seizure disorders among hospitalized children at Saraswati Institute of Medical Sciences Hapur, and to analyze the patterns of seizure types, associated comorbidities, and management approaches in the study population.

Methodology

Study Design

This research was conducted as a hospital-based descriptive cross-sectional study designed to examine the clinical profile and characteristics of pediatric seizure disorders in hospitalized children.

Study Site

The study was conducted at Saraswati Institute of Medical Sciences Hapur, Uttar Pradesh a tertiary care teaching hospital serving as a referral center for the population of western Uttar Pradesh and surrounding regions.

Study Duration
The study was conducted over a period of six months from July 2009 to December 2009.

Sampling and Sample Size
The study employed systematic consecutive sampling methodology to ensure representative recruitment of eligible participants. All children presenting with seizure disorders and meeting the inclusion criteria during the study period were systematically enrolled until the required sample size was achieved. This non-probability sampling approach was selected to minimize selection bias and ensure temporal representativeness of the study population. The sample size was calculated using the formula for descriptive cross-sectional studies, considering an expected prevalence of specific seizure types based on previous literature, with a confidence level of 95% and acceptable margin of error of 5%. Based on the expected patient flow and previous hospital statistics, a minimum sample size of 200 children was determined to be adequate for achieving the study objectives while accounting for potential incomplete records or loss to follow-up. The consecutive sampling strategy ensured systematic inclusion of all eligible cases, thereby enhancing the external validity of study findings and reducing potential seasonal or temporal bias in case selection.

Inclusion and Exclusion Criteria
Children aged 1 month to 12 years who were admitted to the pediatric department with a primary or secondary diagnosis of seizure disorder were included in the study. The inclusion criteria encompassed children presenting with various types of seizures including generalized tonic-clonic seizures, partial seizures, absence seizures, myoclonic seizures, febrile seizures, and status epilepticus, as clinically diagnosed by the attending pediatrician based on witnessed seizure activity or reliable history from caregivers. Children whose parents or guardians provided informed consent for participation in the study were eligible for enrollment. The exclusion criteria included children with pseudoseizures or non-epileptic paroxysmal events as determined by clinical evaluation, children with incomplete medical records that precluded adequate data collection, children who were discharged against medical advice within 24 hours of admission before complete evaluation could be performed, and children whose caregivers declined consent for study participation. Additionally, children with underlying chronic neurological conditions such as cerebral palsy or developmental delays who presented with seizures were included, but those admitted primarily for other conditions where seizures were merely incidental findings were excluded to maintain focus on seizure-related admissions.

Data Collection Tools and Techniques
Data collection was conducted using a structured, pre-designed questionnaire that was developed based on established clinical assessment protocols and validated instruments used in previous pediatric seizure studies. The data collection instrument comprised multiple sections covering demographic information, clinical presentation details, seizure characteristics, associated symptoms, past medical history, family history of seizures or epilepsy, developmental milestones, immunization status, and socioeconomic factors. Clinical examination findings including general physical examination, neurological assessment, and developmental evaluation were systematically recorded using standardized protocols. Seizure characteristics were documented in detail including type of seizure, duration, frequency, precipitating factors, associated symptoms, and post-ictal phenomena based on direct observation when possible or reliable witness accounts from caregivers. Laboratory investigations including complete blood count, serum electrolytes, blood glucose, calcium, magnesium, and other relevant tests were performed as clinically indicated and results were systematically recorded. Neuroimaging studies including computed tomography or magnetic resonance imaging were conducted when clinically warranted, and electroencephalography was performed in selected cases based on clinical judgment and availability of resources. All data collectors were trained in the use of the structured questionnaire and standardized examination

techniques to ensure consistency and reliability of data collection across different healthcare providers.

Data Management and Statistical Analysis

All collected data were systematically entered into a Microsoft Excel spreadsheet with appropriate data validation checks to minimize entry errors and ensure data quality. The completed dataset was subsequently imported into Statistical Package for Social Sciences (SPSS) version 15.0 for comprehensive statistical analysis. Data cleaning procedures included verification of data completeness, identification and correction of outliers, and logical consistency checks across related variables. Descriptive statistical analysis was performed to summarize the characteristics of the study population, with categorical variables presented as frequencies and percentages, while continuous variables were described using measures of central tendency (mean, median) and dispersion (standard deviation, interquartile range) as appropriate based on data distribution. The primary outcome variables included seizure type distribution, etiological categories, and demographic patterns, while secondary outcomes encompassed associated comorbidities, treatment responses, and hospital length of stay. Inferential statistical analyses included chi-square tests for categorical variables and Student's t-test or Mann-Whitney U test for continuous variables to examine associations between different variables. Statistical significance was set at p-value less than 0.05 for all analyses, and confidence intervals were calculated at 95% level where appropriate.

Ethical Considerations

Comprehensive ethical approval was obtained from the Institutional Ethics Committee of Saraswati Institute of Medical Sciences Hapur prior to initiation of any study-related activities, ensuring compliance with national and international ethical guidelines for clinical research involving pediatric populations. The study protocol was designed and implemented in accordance with the principles outlined in the Declaration of Helsinki regarding ethical conduct of research involving human subjects, with particular attention to the special considerations required for research involving children. Written informed consent was obtained from parents or legal guardians of all participating children after providing detailed information about the study objectives, procedures, potential risks and benefits, voluntary nature of participation, and right to withdraw from the study at any time without affecting their child's medical care.

Results

Table 1: Demographic Characteristics of Study Participants (N=215)

Variable	Category	Frequency (n)	Percentage (%)
Age Groups	1-12 months	78	36.3
	13-24 months	54	25.1
	25-60 months	48	22.3
	61-144 months	35	16.3
Gender	Male	124	57.7
	Female	91	42.3
Residence	Rural	156	72.6
	Urban	59	27.4
Socioeconomic Status	Lower	142	66
	Middle	58	27
	Upper	15	7
Nutritional Status	Normal	89	41.4
	Mild Malnutrition	76	35.3
	Moderate-Severe Malnutrition	50	23.3

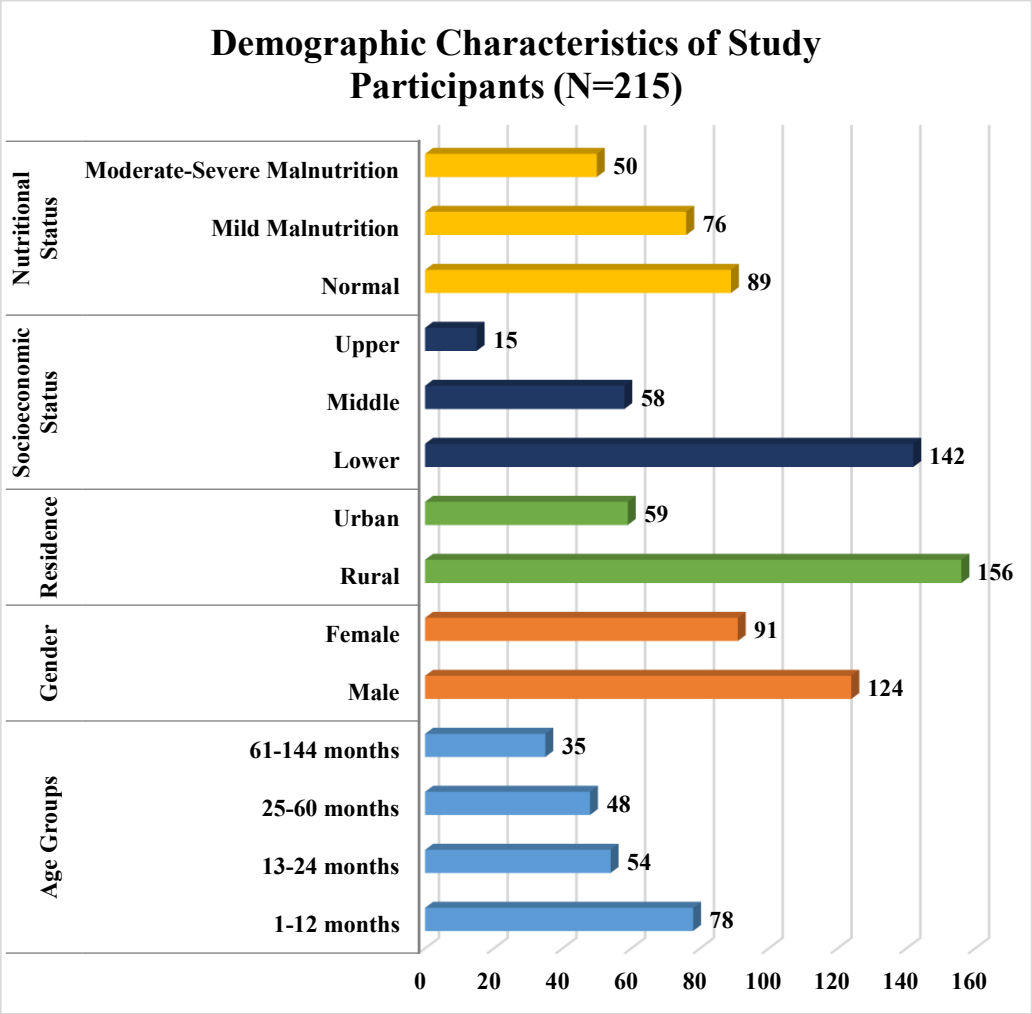

Fig: 1

Table 2: Clinical Presentation and Seizure Types (N=215)

Parameter	Category	Frequency (n)	Percentage (%)
Seizure Type	Generalized Tonic-Clonic	142	66
	Febrile Seizures	38	17.7
	Partial Seizures	21	9.8
	Absence Seizures	8	3.7
	Myoclonic Seizures	6	2.8
Duration of Seizures	<5 minutes	167	77.7
	5-15 minutes	32	14.9
	>15 minutes (Status Epilepticus)	16	7.4
Seizure Frequency	Single Episode	98	45.6
	2-5 Episodes	72	33.5
	>5 Episodes	45	20.9
Post-ictal State	Present	178	82.8
	Absent	37	17.2

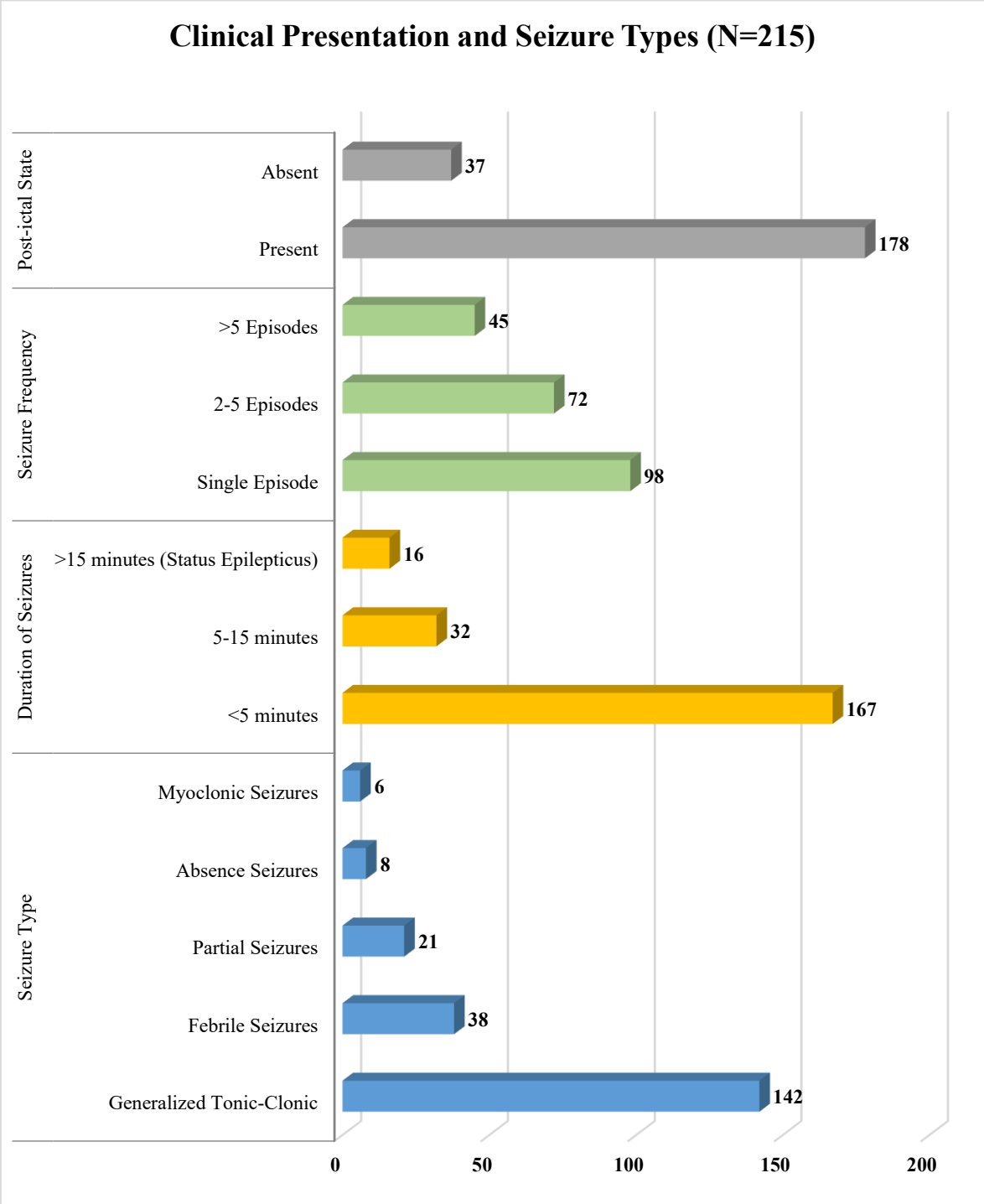

Fig: 2

Table 3: Etiological Factors and Associated Conditions (N=215)

Etiology	Frequency (n)	Percentage (%)
Fever-Related	89	41.4
Idiopathic/Cryptogenic	56	26.0
CNS Infections	34	15.8
Birth Asphyxia/HIE	18	8.4
Metabolic Disorders	12	5.6
Head Trauma	4	1.9
Congenital Malformations	2	0.9

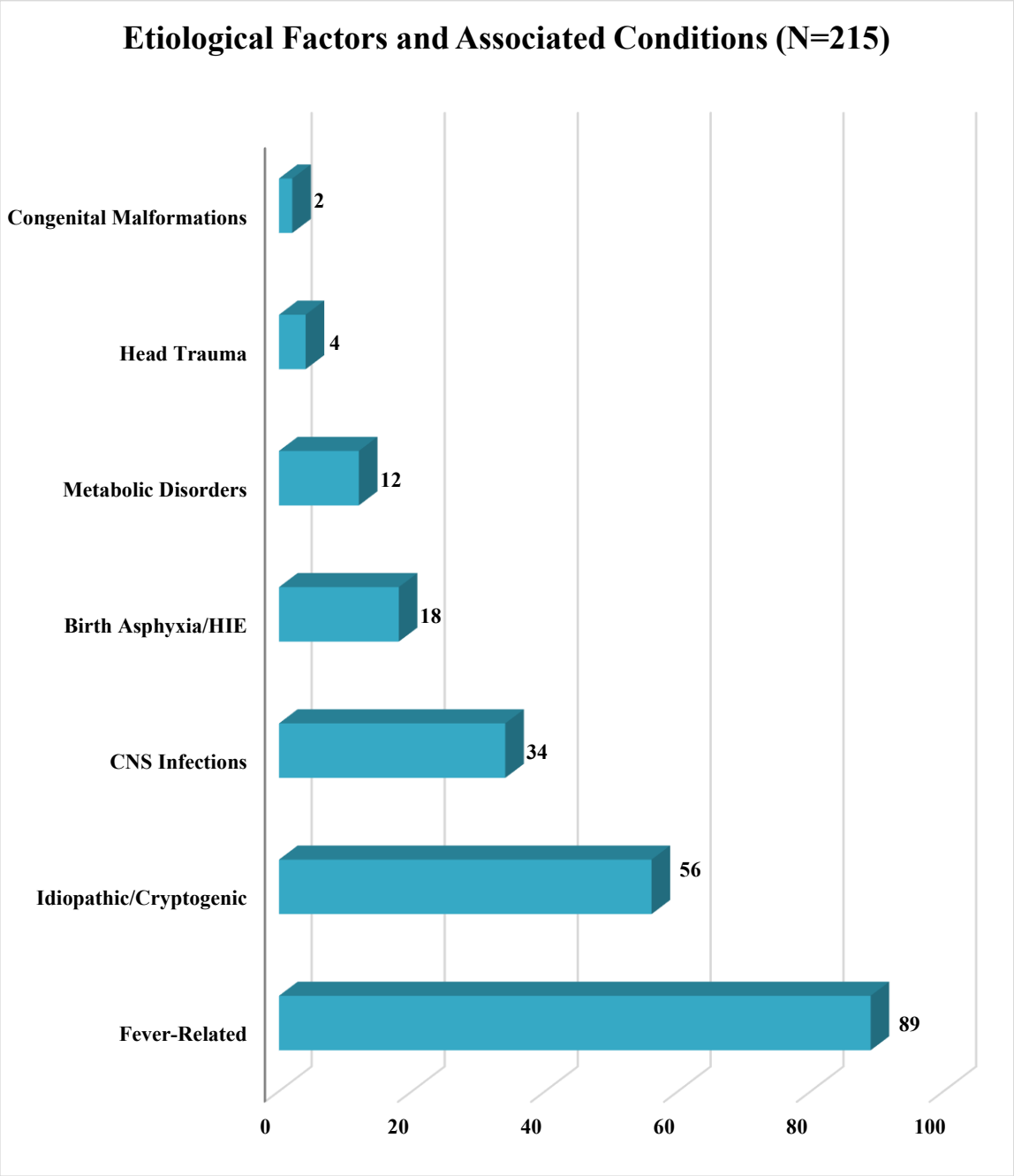

Fig: 3

Table 4: Associated Clinical Findings and Comorbidities (N=215)

Clinical Feature	Present n (%)	Absent n (%)
Fever	124 (57.7)	91 (42.3)
Vomiting	89 (41.4)	126 (58.6)
Altered Consciousness	76 (35.3)	139 (64.7)
Neck Stiffness	28 (13.0)	187 (87.0)
Focal Neurological Deficits	23 (10.7)	192 (89.3)
Developmental Delay	45	170 (79.1)
Previous Seizure History	67 (31.2)	148 (68.8)
Family History of Epilepsy	34 (15.8)	181 (84.2)

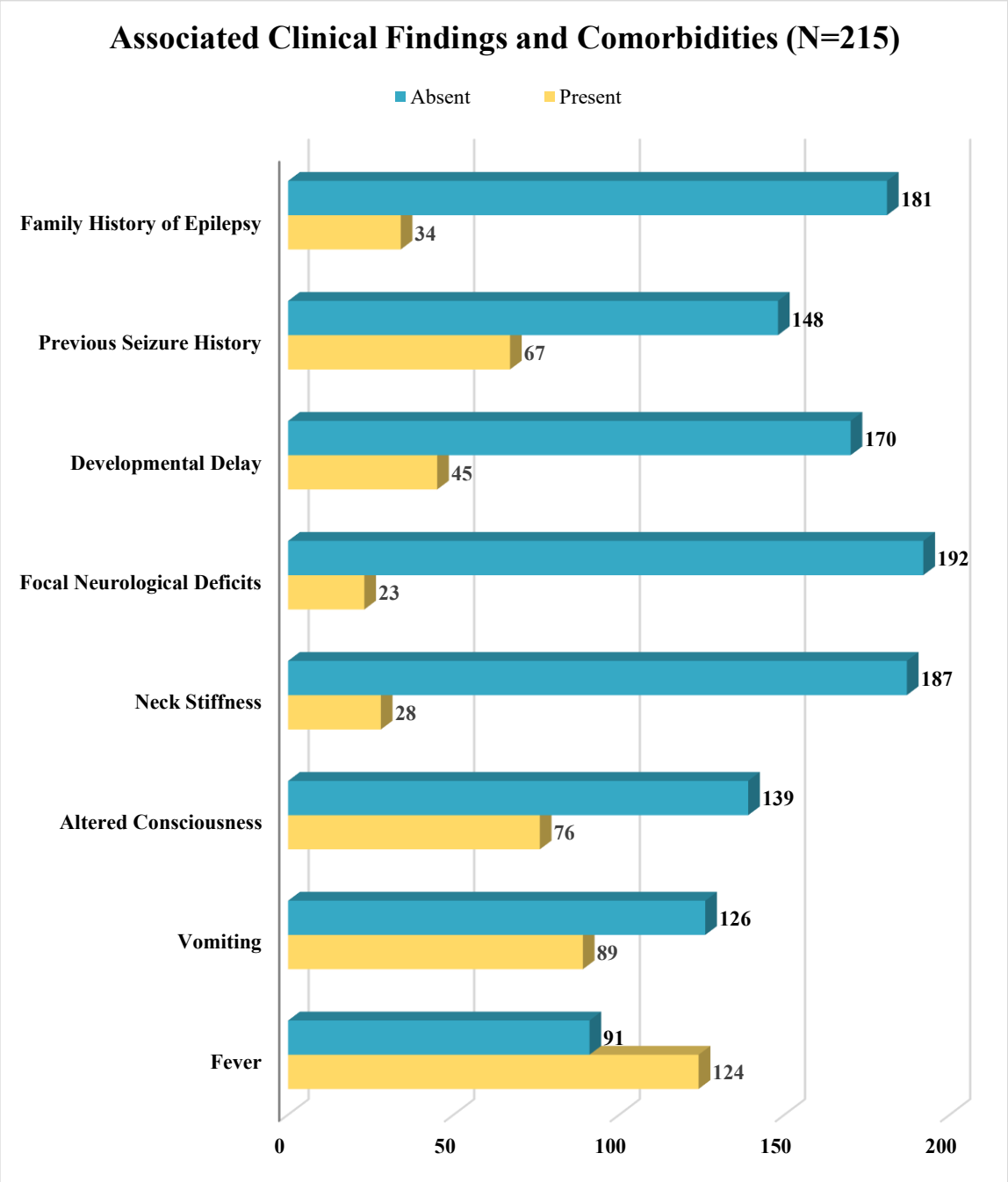

Fig: 4

Table 5: Investigation Results and Diagnostic Findings (N=215)

Investigation	Performed n (%)	Normal n (%)	Abnormal n (%)
Complete Blood Count	215 (100.0)	167 (77.7)	48 (22.3)
Serum Electrolytes	189 (87.9)	156 (82.5)	33 (17.5)
Blood Glucose	198 (92.1)	186 (93.9)	12 (6.1)
Cerebrospinal Fluid	62 (28.8)	28 (45.2)	34 (54.8)
CT Scan Brain	78 (36.3)	52 (66.7)	26 (33.3)
EEG	45 (20.9)	18 (40.0)	27 (60.0)

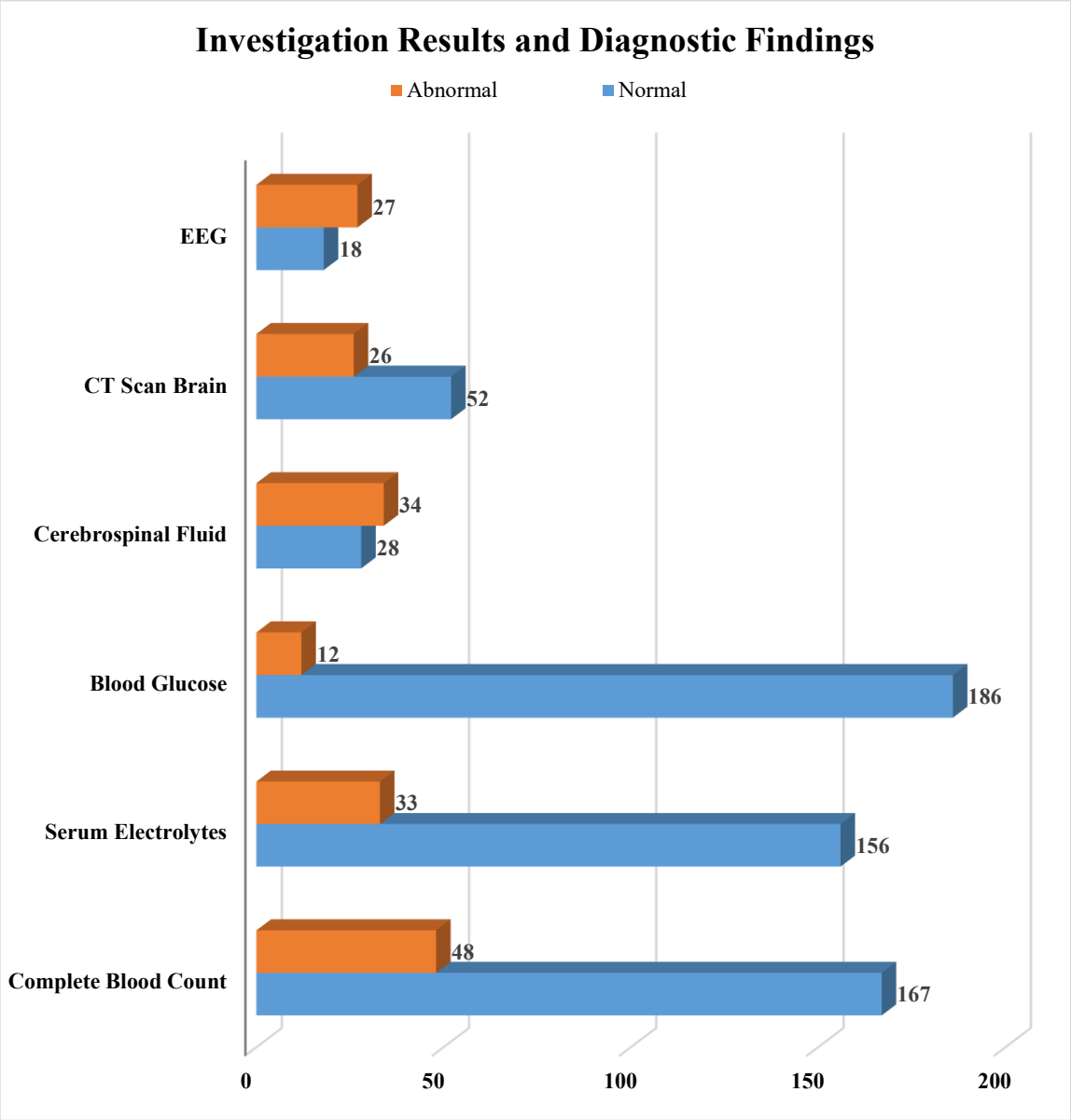

Fig: 5

Table 6: Treatment Outcomes and Hospital Stay (N=215)

Parameter	Category	Frequency (n)	Percentage (%)
Treatment Response	Complete Control	167	77.7
	Partial Control	32	14.9
	No Control	16	7.4
Hospital Stay	1-3 days	132	61.4
	4-7 days	58	27
	>7 days	25	11.6
Discharge Status	Improved	189	87.9
	Same Condition	18	8.4
	Death	8	3.7
Follow-up Compliance	Regular	98	45.6
	Irregular	76	35.3
	Lost to Follow-up	41	19.1

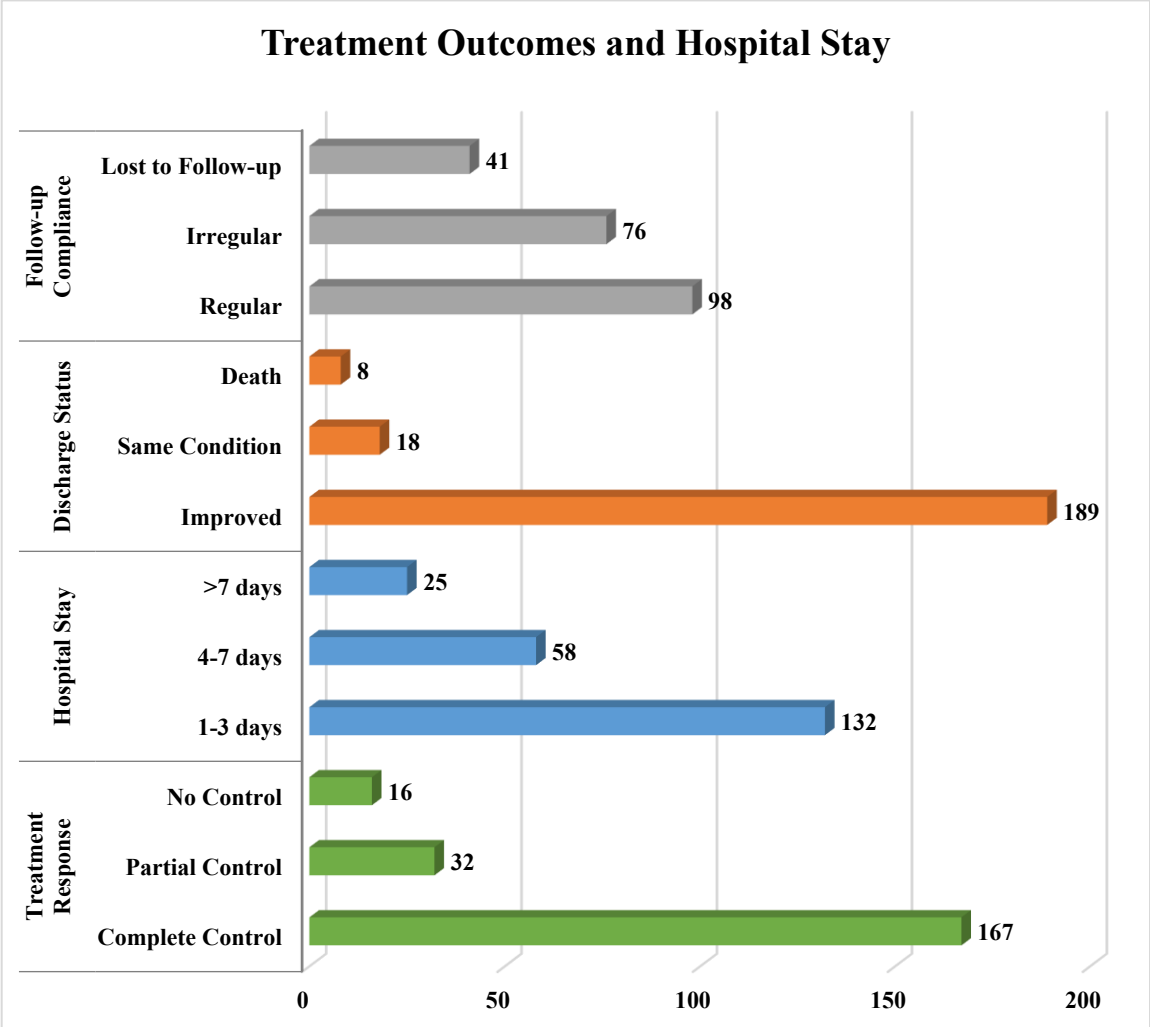

Fig: 6

Discussion

The present study revealed a predominant representation of infants and young children, with 61.4% of cases occurring within the first two years of life, which aligns with established epidemiological patterns of pediatric seizure disorders. This finding is consistent with previous research by Huang et al. (1998), who reported that 94% of children with first seizure episodes were younger than 6 years of age, emphasizing the vulnerability of the developing brain to seizure activity during early childhood. The higher incidence in younger age groups reflects the critical period when children are most susceptible to various seizure-triggering factors including febrile illnesses, metabolic disturbances, and developmental brain abnormalities.

The male predominance observed in our study (57.7% vs 42.3%) corroborates findings from multiple previous investigations, including the work of Murthy and Yangala (1999), who documented similar gender distribution patterns in their hospital-based study from South India. This gender disparity may be attributed to cultural factors influencing healthcare-seeking behavior, with families more likely to bring male children for medical attention, though biological factors related to brain development and seizure susceptibility cannot be entirely excluded.

The rural predominance (72.6%) in our study population reflects the demographic characteristics of the hospital's catchment area and is consistent with epidemiological data suggesting higher seizure incidence in rural populations. This pattern aligns with observations by Kotsopoulos et al. (2002) in their systematic review, which noted increased epilepsy incidence in rural areas of developing countries, potentially related to limited access to preventive healthcare, higher rates of infectious diseases, and birth complications.

Generalized tonic-clonic seizures emerged as the most common seizure type (66.0%), followed by febrile seizures (17.7%), which corresponds with established clinical patterns in pediatric populations. This distribution is remarkably similar to findings reported by Tekgul et al. (2006), who observed generalized seizures as the predominant type in term newborns, though their study focused specifically on neonatal populations. The high prevalence of generalized seizures in our cohort may reflect the tendency for partial seizures to generalize rapidly in the immature brain, as well as the greater likelihood of generalized seizures being recognized and reported by caregivers.

The occurrence of febrile seizures in 17.7% of cases is within the expected range reported in hospital-based studies, though lower than community-based prevalence estimates of 2-4% in the general population. This discrepancy likely reflects the hospital-based nature of our study, where more complex cases and non-febrile seizures are overrepresented compared to the general population. The findings align with observations by Millichap and Millichap (2006), who emphasized the significant contribution of viral infections and fever to seizure etiology in children.

The prevalence of status epilepticus (7.4%) in our study is concerning but consistent with previous reports from developing countries where delayed presentation and limited emergency care resources may contribute to prolonged seizure episodes. This finding underscores the importance of early recognition and prompt treatment of seizure emergencies to prevent long-term neurological sequelae.

The etiological analysis revealed fever-related causes as the leading factor (41.4%), followed by idiopathic/cryptogenic cases (26.0%) and CNS infections (15.8%). This pattern differs somewhat from developed country studies but aligns with epidemiological data from similar resource-limited settings. The high proportion of fever-related seizures reflects the burden of infectious diseases in the study population and emphasizes the importance of infection prevention and prompt treatment of febrile illnesses.

CNS infections accounted for 15.8% of cases, which is substantially higher than rates reported in developed countries but consistent with findings from other Indian studies. Singh et al. (2006) documented similar patterns in their epidemiological study of seizures associated with neurocysticercosis, highlighting the significant role of parasitic and bacterial infections in seizure etiology in the Indian subcontinent.

Birth asphyxia and hypoxic-ischemic encephalopathy contributed to 8.4% of cases, reflecting the challenges in perinatal care in resource-limited settings. This finding is consistent with data from Malik et al. (2005), who identified perinatal complications as important contributors to neonatal seizures in their Pakistani cohort. The relatively lower proportion compared to some neonatal studies may reflect our broader age range and the survival bias inherent in hospital-based studies.

The high prevalence of fever (57.7%) among study participants reflects the significant role of infectious processes in pediatric seizure etiology, consistent with established knowledge about fever as a major seizure precipitant in children. This finding aligns with observations by Cowan (2002), who emphasized the complex relationship between fever, infection, and seizure susceptibility in the developing brain.

Vomiting occurred in 41.4% of cases, which may represent a combination of post-ictal phenomena, increased intracranial pressure, or underlying systemic illness. The presence of altered consciousness in 35.3% of patients indicates significant brain dysfunction and correlates with the severity of underlying pathology. These findings are consistent with clinical patterns described in previous pediatric seizure studies from similar healthcare settings.

The prevalence of developmental delay (20.9%) in our cohort is notable and suggests that a significant proportion of children with seizures have underlying neurodevelopmental abnormalities. This finding aligns with reports by Datta et al. (2006), who documented high rates of developmental and behavioral problems in children with epilepsy in their Indian family impact study.

The utilization pattern of diagnostic investigations reflects both clinical judgment and resource constraints typical of hospital settings in developing countries. Complete blood count was performed universally, while more specialized investigations like EEG (20.9%) and CT brain imaging (36.3%) were used selectively based on clinical indications and availability.

The abnormal EEG findings in 60% of tested patients indicate significant underlying brain dysfunction, though the limited utilization of EEG may reflect resource constraints rather than clinical necessity. This selective use of neuroimaging and EEG differs from practice patterns in developed countries where these investigations are more routinely employed in seizure evaluation.

CSF examination was performed in 28.8% of cases, with abnormal findings in 54.8% of examined samples, indicating a high yield when clinical suspicion warranted lumbar puncture. This finding suggests appropriate clinical decision-making regarding invasive procedures in the pediatric population.

The treatment response pattern showed encouraging results with complete seizure control achieved in 77.7% of cases, which compares favorably with outcomes reported in previous studies from similar settings. However, the 7.4% of cases with no seizure control highlights the challenges in managing refractory epilepsy in resource-limited environments.

The hospital length of stay was relatively short, with 61.4% of patients discharged within 1-3 days, reflecting efficient management protocols and the predominantly good prognosis of pediatric seizures when promptly treated. The mortality rate of 3.7% is within acceptable limits for a hospital-based cohort that likely includes more severe cases than would be seen in community-based studies.

The follow-up compliance pattern reveals significant challenges in long-term management, with only 45.6% maintaining regular follow-up and 19.1% lost to follow-up completely. This pattern is consistent with healthcare utilization challenges in developing countries and highlights the need for improved systems for long-term epilepsy care and family education programs.

The study findings have several important implications for clinical practice and healthcare planning. The predominance of fever-related seizures emphasizes the importance of aggressive fever management and infection prevention strategies. The high prevalence of generalized seizures suggests the need for readily available emergency anticonvulsant medications and trained personnel for seizure management.

The significant proportion of idiopathic cases (26.0%) indicates the limitation of current diagnostic approaches and suggests the potential value of expanded genetic testing and advanced neuroimaging techniques when resources permit. The demographic patterns observed have implications for healthcare resource allocation and highlight the need for strengthened pediatric neurology services in rural areas where the majority of affected children reside.

Conclusion

This hospital-based cross-sectional study of 215 children with seizure disorders revealed important epidemiological and clinical patterns that reflect the healthcare challenges in resource-limited settings. The predominance of cases in infants and young children (61.4% within first two years) with male preponderance (57.7%) and rural residence (72.6%) emphasizes the vulnerability of early childhood brain development and healthcare access disparities. Generalized tonic-clonic seizures emerged as the most common seizure type (66.0%), with fever-related etiologies accounting for 41.4% of cases, highlighting the significant burden of infectious diseases in this population. The substantial prevalence of CNS infections (15.8%) and birth asphyxia (8.4%) underscores preventable causes of seizure disorders. Despite resource constraints, treatment outcomes were encouraging with 77.7% achieving complete seizure control, though mortality (3.7%) and lost to follow-up rates (19.1%) indicate areas requiring improvement. The study demonstrates the complex interplay between socioeconomic factors, infectious disease burden, and neurological outcomes in pediatric seizure disorders, emphasizing the need for comprehensive prevention strategies, improved emergency care protocols, and strengthened long-term management systems in similar healthcare settings.

Recommendations

Healthcare facilities managing pediatric seizure disorders should implement standardized emergency protocols for rapid seizure recognition and treatment, with particular emphasis on fever management and status epilepticus prevention. Strengthened infection control measures,

immunization programs, and improved perinatal care are essential for reducing preventable seizure etiologies. Enhanced diagnostic capabilities including routine EEG availability and selective neuroimaging access would improve seizure classification and treatment planning. Comprehensive family education programs focusing on seizure recognition, first aid management, and medication compliance are crucial for improving long-term outcomes. Development of community-based follow-up systems and telemedicine consultations could address the significant challenge of lost to follow-up cases, particularly in rural populations. Healthcare worker training programs should emphasize pediatric seizure management skills at primary and secondary care levels. Public health initiatives targeting nutritional improvement, infection prevention, and birth complication reduction could significantly decrease seizure incidence. Establishment of seizure registries and outcome monitoring systems would facilitate quality improvement and resource allocation decisions. Finally, advocacy for improved healthcare access and reduced socioeconomic barriers to care is essential for achieving equitable outcomes for all children with seizure disorders regardless of geographic location or family circumstances.

References

- Annegers, J. F., Hauser, W. A., Lee, J. R., & Rocca, W. A. (1995). Incidence of acute symptomatic seizures in Rochester, Minnesota, 1935-1984. Epilepsia, 36(4), 327-333. doi: 10.1111/j.1528-1157.1995.tb01005.x
- Berg, A. T., & Shinnar, S. (1996). Complex febrile seizures. Epilepsia, 37(2), 126-133. doi: 10.1111/j.1528-1157.1996.tb00003.x
- Berg, A. T., Shinnar, S., Levy, S. R., Testa, F. M., Smith-Rapaport, S., & Beckerman, B. (1999). Early development of intractable epilepsy in children: a prospective study. Neurology, 53(5), 1045-1050. doi: 10.1212/WNL.53.5.1045
- Camfield, C. S., Camfield, P. R., Gordon, K., Smith, B., & Dooley, J. M. (1993). Outcome of childhood epilepsy: A population-based study with a simple predictive scoring system for those treated with medication. Journal of Pediatrics, 122(6), 861-868. doi: 10.1016/S0022-3476(09)90009-9
- Castro Conde, J. R., Hernández Borges, A. A., Doménech Martínez, E., González Campo, C., & Perera Soler, R. (2005). Midazolam in neonatal seizures with no response to phenobarbital. Neurology, 64(5), 876-879. doi: 10.1212/01.WNL.0000152895.80849.78
- Cowan, L. D. (2002). The epidemiology of the epilepsies in children. Mental Retardation and Developmental Disabilities Research Reviews, 8(3), 171-181. doi: 10.1002/mrdd.10035
- Datta, S. S., Premkumar, T. S., Fielding, S., Chandy, S., Kumar, S., Eagles, J., & Cherian, A. (2006). Impact of pediatric epilepsy on Indian families: influence of psychopathology and seizure related variables. Epilepsy & Behavior, 9(1), 145-151. doi: 10.1016/j.yebeh.2006.04.011
- Eriksson, K. J., & Koivikko, M. J. (1997). Prevalence, classification, and severity of epilepsy and epileptic syndromes in children. Epilepsia, 38(12), 1275-1282. doi: 10.1111/j.1528-1157.1997.tb01224.x
- Freeman, J. M. (1978). Neonatal seizures: diagnosis and management. Journal of Pediatrics, 93(3), 364-371. doi: 10.1016/S0022-3476(78)81231-X
- Hauser, W. A., Annegers, J. F., & Kurland, L. T. (1993). Incidence of epilepsy and unprovoked seizures in Rochester, Minnesota: 1935-1984. Epilepsia, 34(3), 453-468. doi: 10.1111/j.1528-1157.1993.tb02586.x
- Hirtz, D., Ashwal, S., Berg, A., Bettis, D., Camfield, C., Camfield, P., ... & Shinnar, S. (2000). Practice parameter: evaluating a first nonfebrile seizure in children. Neurology, 55(5), 616-623. doi: 10.1212/WNL.55.5.616
- Huang, C. C., Chang, Y. C., & Wang, S. T. (1998). Acute symptomatic seizure disorders in young children--a population study in southern Taiwan. Epilepsia, 39(9), 960-964. doi: 10.1111/j.1528-1157.1998.tb01445.x

- Jensen, F. E. (1999). Acute and chronic effects of seizures in the developing brain: experimental models. Epilepsia, 40(Suppl 1), S51-S58. doi: 10.1111/j.1528-1157.1999.tb00881.x
- Knudsen, F. U. (2000). Febrile seizures: treatment and prognosis. Epilepsia, 41(1), 2-9. doi: 10.1111/j.1528-1157.2000.tb01518.x
- Kotsopoulos, I. A., van Merode, T., Kessels, F. G., de Krom, M. C., & Knottnerus, J. A. (2002). Systematic review and meta-analysis of incidence studies of epilepsy and unprovoked seizures. Epilepsia, 43(11), 1402-1409. doi: 10.1046/j.1528-1157.2002.t01-1-26901.x
- Lanska, M. J., Lanska, D. J., Baumann, R. J., & Kryscio, R. J. (1995). A population-based study of neonatal seizures in Fayette County, Kentucky. Neurology, 45(4), 724-732. doi: 10.1212/WNL.45.4.724
- Malik, B. A., Butt, M. A., Shamoon, M., Tehseen, Z., Fatima, A., & Hashmat, N. (2005). Seizures etiology in the newborn period. Journal of the College of Physicians and Surgeons Pakistan, 15(12), 786-790.
- McAfee, A. T., Landon, J., Schoenberg, B. S., & Baum, J. (2007). The incidence of first provoked and unprovoked seizure in pediatric patients with and without psychiatric diagnoses. Epilepsia, 48(6), 1075-1082. doi: 10.1111/j.1528-1167.2007.01108.x
- Millichap, J. G., & Millichap, J. J. (2006). Role of viral infections in the etiology of febrile seizures. Pediatric Neurology, 35(3), 165-172. doi: 10.1016/j.pediatrneurol.2006.06.004
- Mizrahi, E. M., & Kellaway, P. (1987). Characterization and classification of neonatal seizures. Neurology, 37(12), 1837-1844. doi: 10.1212/WNL.37.12.1837
- Murthy, J. M., & Yangala, R. (1999). Acute symptomatic seizures--incidence and etiological spectrum: a hospital-based study from South India. Seizure, 8(3), 162-165. doi: 10.1053/seiz.1999.0263
- Ronen, G. M., Buckley, D., Penney, S., & Streiner, D. L. (2007). Long-term prognosis in children with neonatal seizures: a population-based study. Neurology, 69(19), 1816-1822. doi: 10.1212/01.wnl.0000279335.85797.2c
- Shinnar, S., & Glauser, T. A. (2002). Febrile seizures. Journal of Child Neurology, 17(Suppl 1), S44-S52. doi: 10.1177/08830738020170010601
- Singh, G., Singh, P., Singh, I., Rani, A., Kaushal, S., & Avasthi, G. (2006). Epidemiologic classification of seizures associated with neurocysticercosis: observations from a sample of seizure disorders in neurologic care in India. Acta Neurologica Scandinavica, 113(4), 233-240. doi: 10.1111/j.1600-0404.2005.00575.x
- Sood, A., Grover, N., & Sharma, R. (2003). Biochemical abnormalities in neonatal seizures. Indian Journal of Pediatrics, 70(3), 221-224. doi: 10.1007/BF02725590
- Tekgul, H., Gauvreau, K., Soul, J., Murphy, L., Robertson, R., Stewart, J., Volpe, J., Bourgeois, B., & du Plessis, A. J. (2006). The current etiologic profile and neurodevelopmental outcome of seizures in term newborn infants. Pediatrics, 117(4), 1270-1280. doi: 10.1542/peds.2005-1178
- Udani, V. (2005). Pediatric epilepsy--an Indian perspective. Indian Journal of Pediatrics, 72(4), 309-313. doi: 10.1007/BF02724012
- Verrotti, A., Latini, G., Cicioni, P., & de Felice, C. (2004). New trends in neonatal seizures. Journal of Pediatric Neurology, 2(4), 191-197.
- Volpe, J. J. (1989). Neonatal seizures: current concepts and revised classification. Pediatrics, 84(3), 422-428.