

	ORIGINAL RESEARCH PAPER MAGNETIC RESONANCE IMAGING FINDINGS IN PEDIATRIC PATIENTS WITH EPILEPSY: A CROSS-SECTIONAL STUDY AT A TERTIARY CARE CENTRE	Radio-Diagnosis KEY WORDS: Pediatric epilepsy; magnetic resonance imaging; seizure disorders; neuroimaging;
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ABSTRACT	Epilepsy is one of the most common neurological disorders in children, and identifying its underlying structural cause is crucial for appropriate management and prognostication. Magnetic resonance imaging (MRI) is the preferred imaging modality because of its superior soft-tissue resolution and ability to detect epileptogenic lesions. This cross-sectional study evaluated MRI findings in 60 pediatric patients (<16 years) with clinically diagnosed epilepsy who underwent brain MRI at a tertiary care centre between February and July 2025 using a dedicated 1.5-T epilepsy protocol. MRI abnormalities were detected in 40 (66.7%) patients, while 20 (33.3%) had normal examinations. Generalized seizures were the most common presentation (36.7%). Infectious lesions constituted the predominant etiology (20.0%), followed by hypoxic-ischemic encephalopathy (13.3%), malformations of cortical development (8.3%), miscellaneous disorders (10.0%), neoplasms (6.7%), vascular lesions (6.7%), and metabolic disorders (1.7%). MRI demonstrated a high diagnostic yield in pediatric epilepsy by identifying structural abnormalities in approximately two-thirds of patients.	
INTRODUCTION	Epilepsy is one of the most common chronic neurological disorders in children and is characterized by recurrent unprovoked seizures resulting from abnormal, excessive neuronal activity in the brain. It accounts for a significant proportion of pediatric neurological consultations and is associated with considerable morbidity, impaired neurodevelopment, cognitive dysfunction, and reduced quality of life. Early identification of the underlying etiology is essential for appropriate management, prognostication, and prevention of long-term neurological sequelae. Neuroimaging has become an indispensable component in the evaluation of children with epilepsy, particularly in those with focal seizures, refractory epilepsy, developmental delay, or abnormal neurological examination. Among the available imaging modalities, magnetic resonance imaging (MRI) is considered the gold standard because of its excellent soft tissue contrast, multiplanar imaging capability, and superior sensitivity in detecting structural brain abnormalities. MRI facilitates the identification of congenital malformations, hypoxic-ischemic brain injury, infections, neoplasms, vascular lesions, metabolic disorders, and other epileptogenic abnormalities that may not be evident on computed tomography or routine clinical evaluation. Advances in dedicated epilepsy MRI protocols have substantially improved the detection of subtle cortical abnormalities, including focal cortical dysplasia, heterotopia, and hippocampal abnormalities, thereby influencing treatment strategies and surgical planning in selected patients. Identifying the structural cause of epilepsy not only aids in accurate etiological classification but also helps predict clinical outcomes and optimize patient management.. The present cross-sectional study was undertaken to evaluate the spectrum of MRI findings in pediatric patients with epilepsy and to identify the structural abnormalities associated with seizure disorders in children attending a tertiary care center. The study also aims to assess the distribution of various etiologies and emphasize the role of MRI in the diagnostic workup and management of pediatric epilepsy.	
Materials and Methods Study Design	This cross-sectional observational study was conducted in the Department of Radiodiagnosis at Index Medical College Hospital and Research Centre, Indore. The study included pediatric patients clinically diagnosed with epilepsy who underwent magnetic resonance imaging (MRI) of the brain between February 2025 and July 2025. The primary objective was to evaluate the spectrum of structural brain abnormalities detected on MRI and determine their etiological association with seizure disorders. Study Population A total of 60 pediatric patients aged below 16 years with clinically diagnosed epilepsy who underwent MRI evaluation during the study period were included. Inclusion Criteria Pediatric patients (<16 years of age) with a clinical diagnosis of seizure disorder who were referred for MRI. Patients undergoing MRI as part of the diagnostic evaluation of epilepsy. Exclusion Criteria Patients whose guardians declined consent. Patients with contraindications to MRI, including cardiac implantable electronic devices, incompatible metallic implants, or metallic foreign bodies. Patients with incomplete clinical or imaging records. MRI Protocol MRI examinations were performed using a 1.5 Tesla GE SIGNA Explorer scanner. A dedicated epilepsy protocol was used, including axial, sagittal, and coronal T1-weighted, T2-weighted, FLAIR, Susceptibility-Weighted Imaging (SWI), Diffusion-Weighted Imaging (DWI), and Apparent Diffusion Coefficient (ADC) sequences. Intravenous gadolinium-based contrast was administered whenever clinically indicated, particularly in patients with suspected infections, neoplasms, inflammatory lesions, or vascular abnormalities. Statistical Analysis Data were compiled and analyzed using descriptive statistics. Continuous variables were summarized where appropriate, while categorical variables were expressed as frequencies and percentages. Patient demographics, seizure types, and MRI findings were tabulated to describe the distribution of structural abnormalities and the etiological spectrum of epilepsy in the study population.	
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Results
Demographic Characteristics
 A total of 60 pediatric patients with clinically diagnosed epilepsy were included. There was a slight male predominance (32 males, 28 females)

Table 1. Age and gender distribution.

Age Group	Male	Female	Total
0-4	9	6	15
5-8	6	8	14
9-12	7	6	13
13-16	10	8	18
Total	32	28	60

Distribution of Seizure Types

Generalized seizures were most common

Table 2. Distribution according to seizure type.

Type	Number	%
Generalized	22	36.6
Focal	18	30
Combined	20	33.3
Total	60	100

MRI Findings

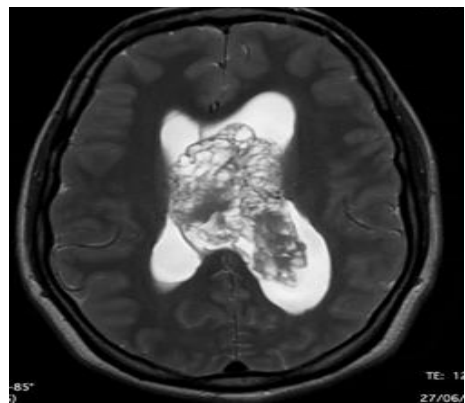
MRI abnormalities were detected in 66.7% of patients

Finding	Number	%
Normal MRI	20	33.3
Infections	12	20
HIE	8	13.3
MCD	5	8.3
Tumors	4	6.6
Vascular	4	6.6
Misc	6	10
Metabolic	1	1.6

Representative cases

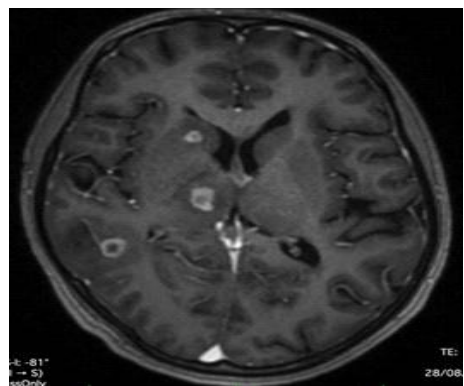


Case 1. Subependymal heterotopia in bilateral occipital horn of lateral ventricle.

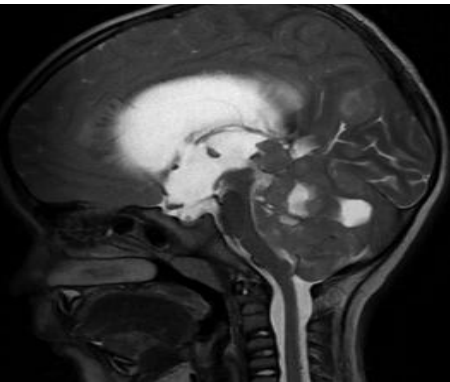


Case 2. Large lobulated solid cystic lesion noted in left lateral ventricle attached to septum pellucidum giving

soap bubble appearance suggestive of central neurocytoma.



Case 3. multiple conglomerated ring enhancing tuberculoma



Case 4. Large colloid cystic ependymoma of 4th ventricle

DISCUSSION

In the present study, MRI demonstrated structural brain abnormalities in 66.7% of pediatric patients with epilepsy, while 33.3% of patients had normal MRI findings. This highlights the significant role of MRI in identifying epileptogenic lesions and determining the underlying etiology of seizures in children. The high diagnostic yield observed in the present study is consistent with previous reports, which have established MRI as the imaging modality of choice for evaluating pediatric epilepsy, particularly in patients with focal seizures, developmental delay, or refractory epilepsy.

Infectious etiologies were the most common MRI abnormality, accounting for 20% of cases. Tuberculomas, meningitis, and viral encephalitis constituted the major infectious lesions identified. The predominance of infectious causes reflects the epidemiological pattern observed in developing countries, where central nervous system infections continue to be an important cause of childhood epilepsy. Early MRI evaluation facilitates prompt diagnosis and appropriate management.

Hypoxic-ischemic encephalopathy (HIE) was the second most common etiology (13.3%). MRI findings included gliosis, encephalomalacia, and periventricular white matter injury, reflecting chronic sequelae of perinatal hypoxic insult. These findings emphasize the importance of improved perinatal care.

Malformations of cortical development accounted for 8.3% of MRI abnormalities and included focal cortical dysplasia, subependymal heterotopia, schizencephaly, and porencephalic cysts. These congenital anomalies are recognized causes of medically refractory epilepsy, and dedicated epilepsy MRI protocols improve their detection.

Neoplastic lesions, including ependymoma, central

neurocytoma, and neurofibromatosis type 2-associated tumors, accounted for 6.6% of cases. Vascular abnormalities such as infarcts, gliosis, and cystic encephalomalacia were also identified, demonstrating the diverse etiological spectrum of pediatric epilepsy.

The findings are comparable to those reported by Kalnin et al. and Yapici and Uzunhan, who also highlighted the value of MRI in identifying structural causes of epilepsy and guiding treatment decisions.

CONCLUSION

MRI plays a pivotal role in identifying structural abnormalities in pediatric epilepsy and should be considered the imaging modality of choice for etiological evaluation and treatment planning.

Limitations

This was a single-center retrospective study with a relatively small sample size. Advanced MRI techniques and long-term follow-up were unavailable for all patients.

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