

Original Research Article

High-Field Magnetic Resonance Imaging Findings in Children with Seizures in Babcock University Teaching Hospital, Ilishan-Remo, Nigeria

Erinle, Sunday Adesubomi^{1*}, Thompson, Mary Umoh¹, Ogunniran, Solomon Fikayo², Bassey, Aniekeme Sunday², Ifonlaja Opeoluwa²

¹Department of Radiology, Babcock University/Babcock University Teaching Hospital, PMB 4003, Ilishan-Remo 121103, Ogun State, Nigeria

²Department of Radiology, Babcock University Teaching Hospital, PMB 4003, Ilishan-Remo 121103, Ogun State, Nigeria

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Abstract: Magnetic resonance imaging (MRI) remains the modality of choice in the investigation of children with seizures especially in age groups that can no longer be examined using transfontanelle ultrasound. High-field MRI equipment, with at least a 1.5 Tesla magnetic field strength, is best used to evaluate these children. This research aimed to audit MRI findings in children (0–17 years) imaged in our department for seizures over a 2-year period (January 2024–January 2026). We retrospectively reviewed the Department of Radiology records at Babcock University Teaching Hospital, Ilishan-Remo, South-West Nigeria, which has a General Electric 1.5 Tesla MRI machine. The MRI findings were recorded in Microsoft Excel and then entered and analysed using SPSS version 25. The Babcock University Research Ethics Committee approved the study. Out of a total of one hundred and six (106) children who had brain MRI within the review period, there were thirty-seven (37) with seizures. Most children with seizures were adolescents (13–17 years, 59.46%), followed by school-aged children (6–12 years, 13.51%) and toddlers (1–3 years, 13.51%). The female-to-male ratio was 1:1.06. MRI abnormalities were found in 21 out of 37 (54.56%) of seizure cases, more in males. The main abnormal brain findings in children presenting with seizures were generalised cerebral atrophy (GCA), focal cortical dysplasia (FCD), mesial temporal sclerosis, infarcts, gliosis, and hypoxic-ischaemic encephalopathy (HIE). Our findings are comparable to those in previous studies. High-field Magnetic Resonance Imaging remains a valuable modality for evaluating seizures in children.

Keywords: Magnetic Resonance Imaging, Spectrum, Findings, Children, Seizures.

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INTRODUCTION

Seizures are attacks of the nervous system that cause sudden, reversible changes in mental status or somatosensory function and tend to be stereotypical and repetitive (Wirrell 2016 in Khosronejad *et al.*, 2022). During a seizure, many neurons fire simultaneously at a much faster rate than normal. This surge of excessive electrical activity may cause involuntary movements, sensations, emotions, and/or behaviours. This disruption of normal nerve cell activity may cause a loss of awareness (NIH, 2026). Epilepsy is a chronic brain disorder in which groups of nerve cells, or neurons, in the brain sometimes send the wrong signals and cause seizures (NIH, 2026). About 4-5% of children experience at least one seizure (febrile or afebrile) during the first sixteen years, 3% of which are caused by epilepsy (Roberts, 2016, in Khosronejad *et al.*, 2022).

Magnetic resonance imaging (MRI) remains the modality of choice in the investigation of children with seizures (NIH, 2026), especially in age groups that can no longer be examined using transfontanelle ultrasound. High-field MRI equipment with at least a 1.5 Tesla magnetic field strength is best for evaluating these children for brain abnormalities (Akinmoladun *et al.*, 2020; Erinle *et al.*, 2026; Suleiman *et al.*, 2025). Where available, functional MRI is even more valuable for localising the seizure source (NIH, 2026). The literature shows that the stronger the equipment's magnetic field, the better its ability to detect focal brain lesions that may be responsible for intractable seizures (Ahluwalia *et al.*, 2017; Mellerio *et al.*, 2014; Phal *et al.*, 2008 and Zijlmans *et al.*, 2009)

Many workers have documented a wide range of MRI abnormalities in children with seizures in Africa

*Corresponding Author: Erinle, Sunday Adesubomi

Department of Radiology, Babcock University/Babcock University Teaching Hospital, PMB 4003, Ilishan-Remo 121103, Ogun State, Nigeria

and beyond. These include: Akinmoladun *et al.*, (2020), who studied 134 children using 0.35T equipment in Ibadan, South-West Nigeria; Suleiman *et al.*, (2025), who prospectively studied 93 children with non-febrile seizures using a 1.5T machine in Zaria, North-West Nigeria. Dzeffi-Tettey *et al.*, (2022) in Accra, Ghana worked on the images of 191 children that had been examined using 1.5T equipment; Apolot *et al.*, (2022) in Uganda studied 147 children using 1.5T MRI; Samia *et al.*, (2021) in Kenya worked on the images of 288 children that were examined using 1.5T and 3T; Kalnin *et al.*, (2008) in the USA studied 281 children with a range of field strengths from 0.5T - 1.5T; and Khosronejad *et al.*, (2022) in Iran did a case-control comparative study on 72 patients with intractable epilepsy and 200 patients who were responsive to drugs.

This research focuses on patients who presented with seizures among 146 children who had MRI (of whom 106 had brain MRI) at our hospital between January 2024 and January 2026, and aims to document our experience.

MATERIALS AND METHODS

This study was retrospective, descriptive, and cross-sectional. All available brain MRI results of patients who presented with seizures for the age group 0 – 17 years within the period January 2024 to January 2026 were included.

The images used were acquired using a 1.5 Tesla General Electric machine. We collected the MRI results from the Department of Radiology records for all children included in the study using a Microsoft Excel form designed for this purpose, and analysed the data using IBM SPSS Statistics version 25. Specialist radiologists reviewed the MRI images for the included

children on the radiology computer using our department's standard reporting templates.

The standard protocols used for the examination of the brain in children include axial and sagittal T1, axial and sagittal T2, axial T2 Fluid Attenuated Inverse Recovery (FLAIR), axial Diffusion Weighted Imaging (DWI) with the corresponding Apparent Diffusion Coefficient (ADC) maps, Susceptibility Weighted Angiography (SWAN) and axial T1 post-contrast imaging for tumours. As part of our seizure protocol, coronal oblique IRFSE, coronal T2 oblique and sagittal CUBE T1 are included.

Approval for this study was obtained from the Babcock University Health Research Ethics Committee (BUHREC 100/26NB/174)

RESULTS AND DISCUSSION

Results

Out of a total of one hundred and six (106) children who had brain MRI within the review period, there were thirty-seven (37) with seizures. These were mainly in the adolescent age group (13-17 years, 59.46%), followed by the school-age group (6-12 years, 13.51%) and toddlers (1-3 years, 13.51%), as shown in Figure 1. Figure 2 shows the sex distribution. The female-to-male ratio is 1:1.06.

There were 21 abnormal findings out of 37 children with seizures (56.76%), as shown in Table 1b. Figure 3 shows the distribution of findings. The main abnormal brain findings in children presenting with seizures were generalised cerebral atrophy (GCA), focal cortical dysplasia (FCD), mesial temporal sclerosis, infarcts, gliosis, and hypoxic-ischaemic encephalopathy (HIE).

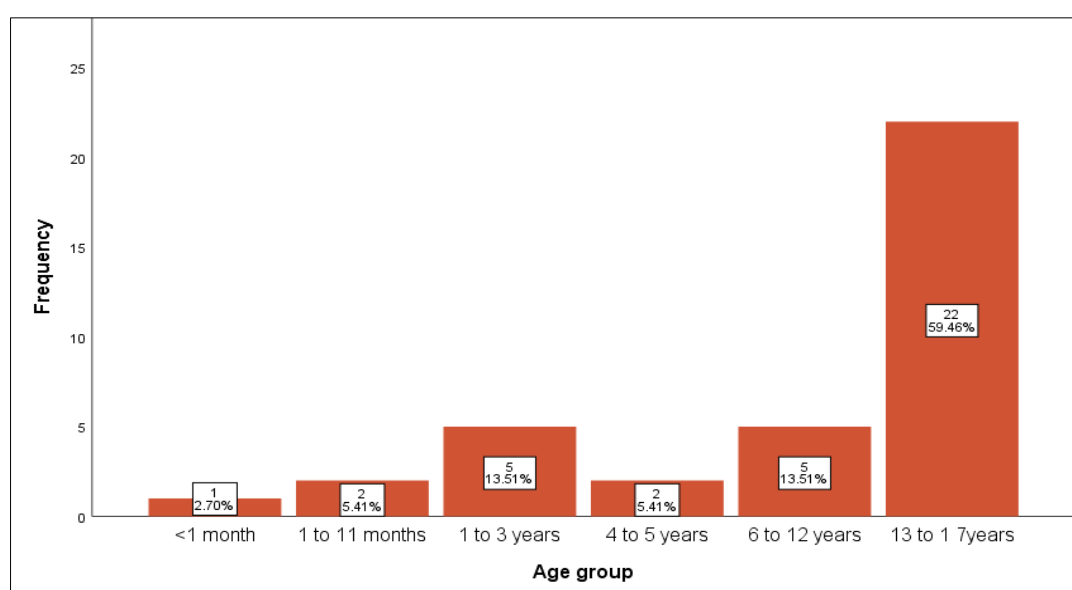


Figure 1: Age distribution of children with seizures

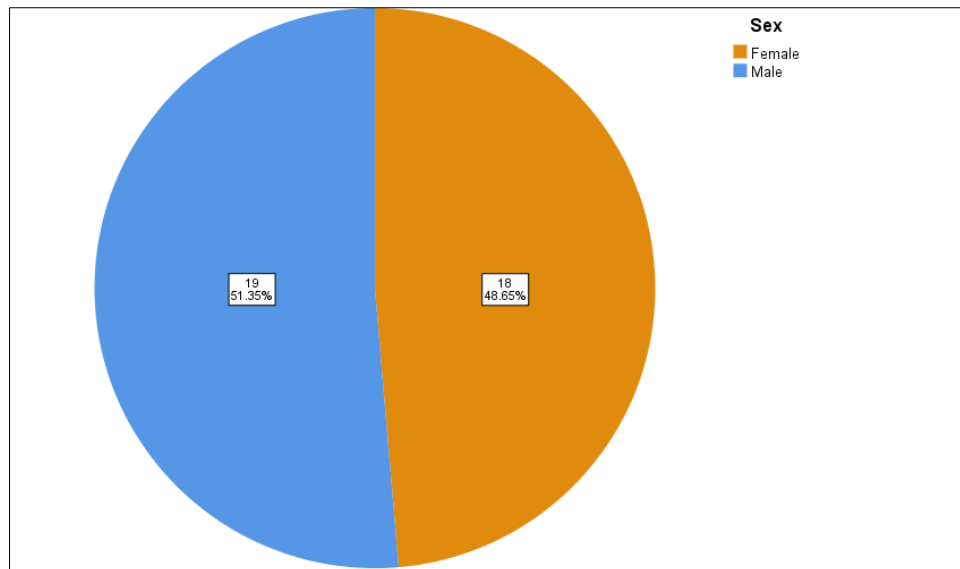


Figure 2: Sex distribution of children with seizures

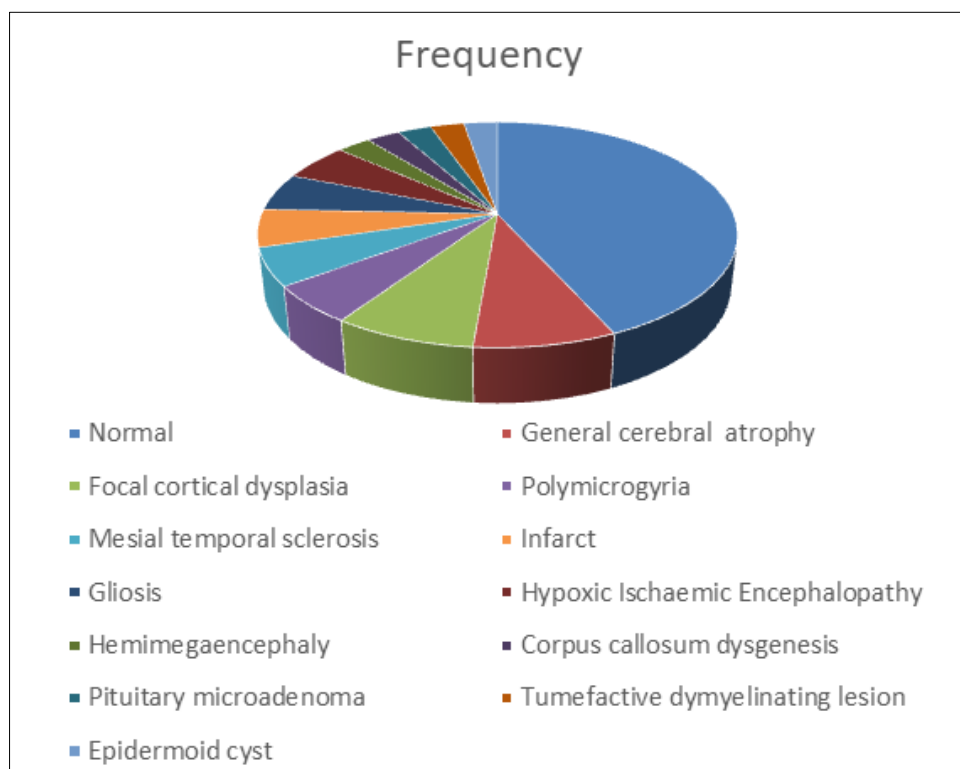


Figure 3: Showing the frequency distribution of the MRI findings in children with seizures

Table 1a: Sex distribution of MRI diagnosis among patients with seizures

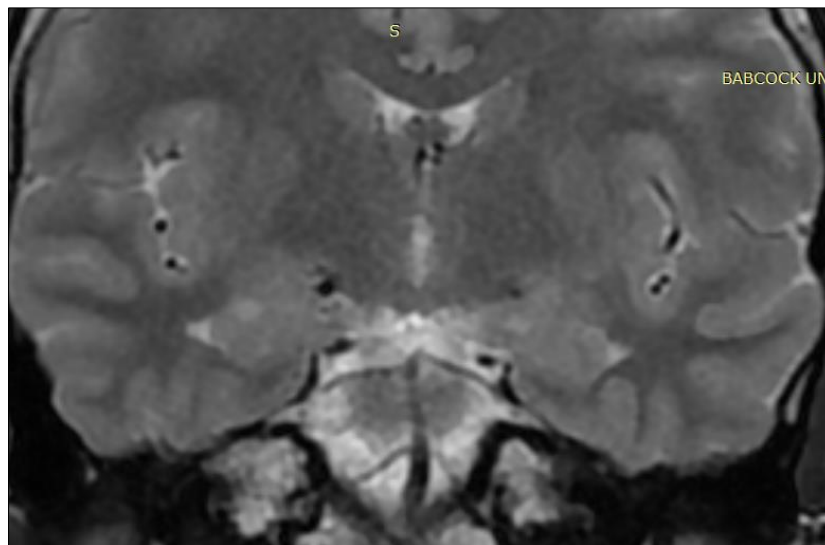
Major diagnosis	Female		Male	
	Frequency	Percentage	Frequency	Percentage
Normal	10	62.50	6	37.50
Infarct	0	0.00	2	100.00
Polymicrogyria	1	50.00	1	50.00
Gliosis	0	0.00	2	100.00
Hypoxic ischaemic encephalopathy	0	0.00	2	100.00
Hemimegaencephaly	0	0.00	1	100.00
General cerebral atrophy	1	33.33	2	66.67
Mesial temporal sclerosis	0	0.00	2	100.00
Pituitary microadenoma	1	100.00	0	0.00

Major diagnosis	Female		Male	
	Frequency	Percentage	Frequency	Percentage
Tumefactive demyelinating lesion	1	100.00	0	0.00
Focal cortical dysplasia	3	100.00	0	0.00
Corpus callosal dysgenesis	0	0.00	1	100.00
Epidermoid cyst	1	100.00	0	0.00

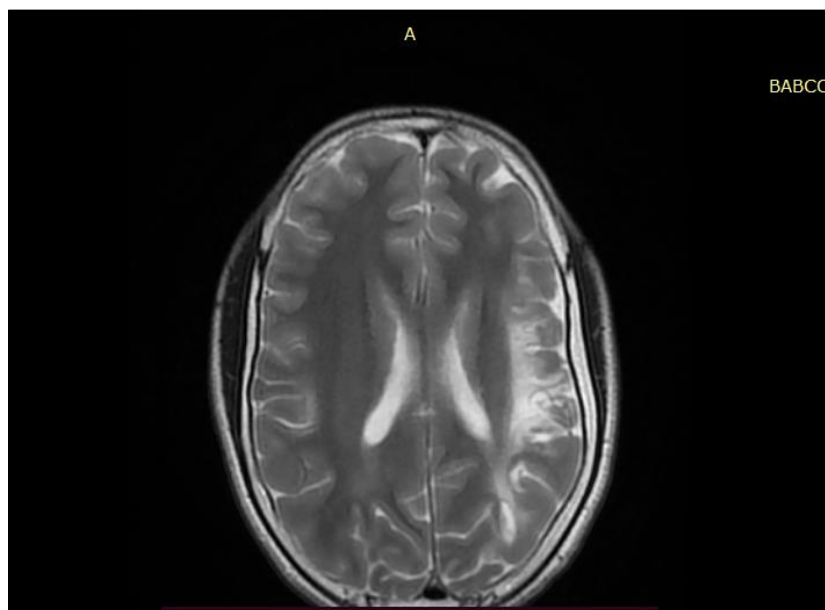
Table 1b: Summary of MRI Findings according to Sex among Children with Seizures

MRI Finding	Females (%)	Males (%)	Total (%)
Normal	10 (62.5)	6 (37.5)	16 (100)
Abnormal	8 (38.1)	13 (61.9)	21 (100)
Total	18 (48.65)	19 (51.35)	37 (100)

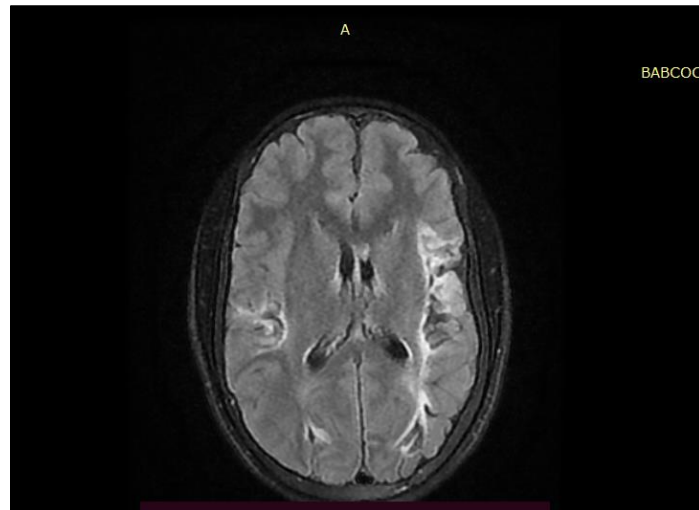
CASES



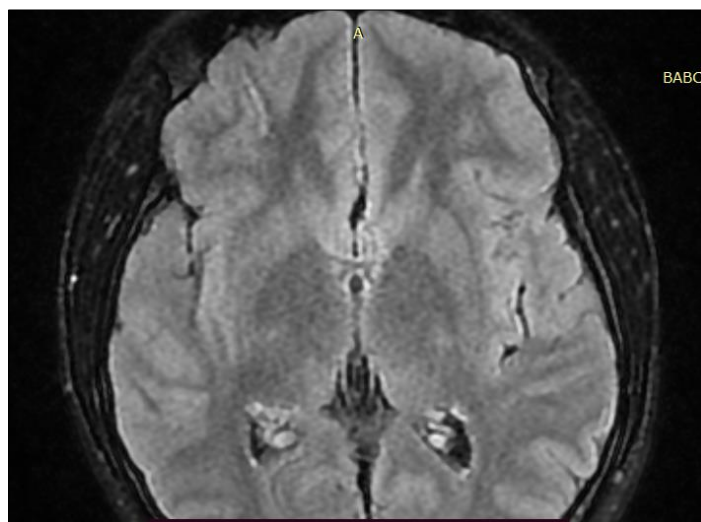
17 years. Male. Seizure disorder.
Coronal T2 MR image shows right hippocampal sclerosis



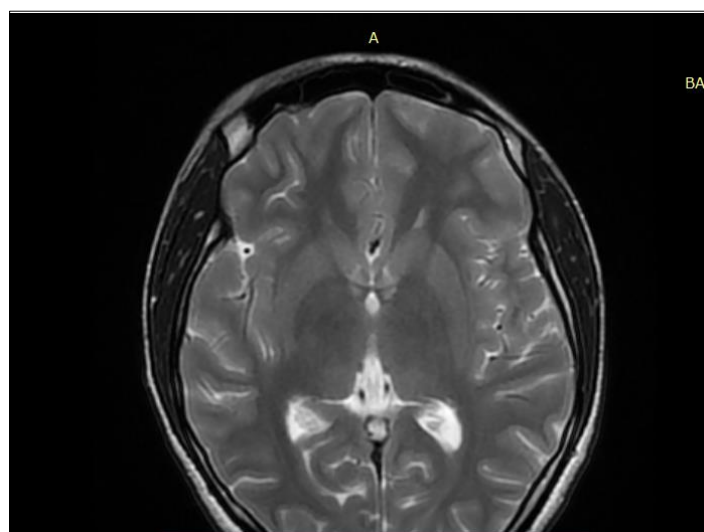
16 years. Male. Sudden onset of generalised seizure.
Axial T2 MRI shows left encephalomalacia with gliosis



16 years. Male. Sudden onset of generalised seizure.
Axial T2 FLAIR MRI shows left encephalomalacia with gliosis



17 years. Female. Recurrent seizures.
Axial T2 FLAIR shows right frontal lobe cortical dysplasia



17 years. Female. Recurrent seizures.
Axial T2 shows right frontal lobe cortical dysplasia

DISCUSSION

This study found that children with seizures were mainly adolescents and of school age. This is similar to the findings by Akinmoladun *et al.*, (2020), Ndubuisi *et al.*, (2016) and Kim *et al.*, (1992). There was no noticeable difference in the sex distribution among the children with seizures in our study. This is in line with the findings by Aaberg *et al.*, (2017), Kalmin *et al.*, (2008) and Mungdala-Odera *et al.*, (2008). On the other hand, Amirsalari *et al.*, (2012), Anand *et al.*, (2017) and Akinmoladun *et al.*, (2020) found more male children than females. Khosronejad *et al.*, (2022) found more males, but the difference was not statistically significant, while Kim *et al.*, (1992) found more females in their own study.

Most children in our study had abnormal findings (21/37 = 55.56%). This is similar to the findings by Akinmoladun *et al.*, in South-West Nigeria (84/134 = 63.4%); Mundhe (2022) in South-East Nigeria (53.4%); Khosronejad *et al.*, (2022) in Iran, among the children with refractory epilepsy (51/72 = 70.84%); Apolot *et al.*, (2022) in Uganda, among children who had prior electroencephalograms (EEG) as screening test before MRI (109/147 = 74.1%); and Alyoubi *et al.*, (2023) among Saudi Arabian children (104/171 = 61.2%). The high cost and low level of availability of high-field MRI in our low-income environment would only allow children with repeated and medically unresponsive seizures to be referred for the examination. The pattern above suggests that more abnormalities are likely to be found on MRI when prior screening for patient selection is done or referral for the examination is determined by affordability and persistent seizures.

There were more abnormalities among male children in our study, similar to the findings by Akinmoladun *et al.*, (2020). This may be because the study had more males than females. We found cerebral atrophy as the most common MRI findings in this study. This agrees with Suleiman *et al.*, (2025), who found cerebral atrophy in 12.9% of 93 children studied in Zaria, North-West Nigeria, and Dzeffi-Tetty *et al.*, (2022), who found cerebral atrophy in 21.5% of 191 children in Ghana. Elmi *et al.*, (2024), in Somalia, also reported brain atrophy in 11.8% of the 102 children studied, while Khosronejad *et al.*, (2022), in Iran, reported cerebral/cerebellar atrophy in 11.11% of 72 patients with intractable epilepsy, and Samia *et al.*, reported cerebral atrophy in 3.8% of 288 children in Kenya. Focal cortical dysplasia (FCD) shares the top position with cerebral atrophy among our study population. Other workers have also reported FCD as an entity. Khandediya *et al.*, (2021), in India reported FCD in 12% of 50 children with epilepsy. Others reported neuronal migration disorders (NMD), now believed to be part of a spectrum of abnormalities that includes FCD (Fernández-Menéndez & Casado, 2016) and is synonymously called malformations of cortical development (MCD). Khosronejad *et al.*, (2022) reported neuronal migration

disorders in 9.72%, Samia *et al.*, (2021) reported them in 3.8%, and Elmi *et al.*, (2024) reported cortical malformations in 2%. Kalnin *et al.*, (2008) reported 12% cortical lesions among children with first-time seizures. The spectrum of malformations of cortical development includes other congenital abnormalities such as lissencephaly, heterotopias, pachygyria, and polymicrogyria. Our study included 2 cases (5.4%) of polymicrogyria and 1 case (2.7%) of hemimegalencephaly, both within the MCD spectrum. Mesial temporal sclerosis was present in 2 cases (5.4%) in our study. Other researchers have also found temporal and hippocampal abnormalities: Kalnin *et al.*, (2008) – 15%; Khosronejad *et al.*, (2022) – 13.88%; Khandediya *et al.*, (2021) – 10%; Elmi *et al.*, (2024) – 13.7%; Apolot *et al.*, (2022) – 32.0%, and Dzeffi-Tetty *et al.*, (2022) – 4.7%. Cerebral infarcts were present in 2 cases (5.4%). This agrees with Akinmoladun *et al.*, (2020), who found the same result in 11.8%, and Suleiman *et al.*, (2025), who found infarcts in 10.8%. Chronic infarcts with associated encephalomalacia were a major finding by Samia *et al.*, (18.6%), and both Kalnin *et al.*, (2008) and Akinmoladun *et al.*, (2020) also reported encephalomalacia in 6% and 7.1% respectively. We also found gliosis (5.4%) and hypoxic ischaemic encephalopathy (HIE - 5.4%) in our study population. Similar features were found by Alyoubi *et al.*, (2023), who found HIE in 12/104 (7.0%); Khandediya *et al.*, (2021) that found HIE in 3/50 (6%). Akinmoladun *et al.*, (2020), with periventricular leukomalacia in 8.2%; Kalnin *et al.*, (2008) reported leukomalacia/gliosis in 23%; and Khosronejad *et al.*, reported gliosis and porencephalic cysts in 4.16%. The remaining less common findings were one case each of pituitary microadenoma, tumefactive demyelination, corpus callosal dysgenesis and epidermoid cyst. Some previous studies also found less common MRI features that were either relevant to or unrelated to seizure causation. (Samia *et al.*, 2021; Akinmoladun *et al.*, 2020)

CONCLUSION

Although our study sample was smaller than most previous studies in this field, a limitation, we found a wide range of MRI abnormalities that align well with other reports of high-field MRI in seizures among children. A more structured study is needed in our environment going forward.

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REFERENCES

- Aaberg KM, Gunnes N, Bakken IJ, Søråas CL, Berntsen A, Magnus P, *et al.* (2017). Incidence and prevalence of childhood epilepsy: A nationwide

- cohort study. *Artic Pediatr*;139: e20163908. <https://doi.org/10.1542/peds.2016-3908>.
- Ahluwalia V. V., Sharma N., Chauhan A., Narayan S., Saharan P. S., Agarwal D. (2017). MRI imaging in afebrile pediatric epilepsy: experience sharing. *Int J Contemp Pediatr* 4: 300-305. <https://dx.doi.org/10.18203/2349-3291.ijcp20164626>.
- Akinmoladun, J., Ogbole, O. I., Famosanya, I. D., Joel, R. (2020). Low-Field Magnetic Resonance Imaging Findings in Children with Seizures in Ibadan, Nigeria. *Annals of Health Research*. 6 (4): 391-401. doi:10.30442/ahr.0604-04-102
- Alyoubi, R. A., Daghistani, R. K., Albogmi, A. M., Alshahrany, T. A., AlAhmed, A. B., Fayoumi, T. A., Alotibi, F. A., Alyazidi, A. S. (2023). The spectrum of MRI and electrographic findings in pediatric patients with seizures: A retrospective tertiary care centre study. *Cureus* 15:e35851.
- Amirsalari, S., Saburi, A., Hadi, R., Mirmohammad, S. (2012). Magnetic Resonance Imaging (MRI) findings in epileptic children and its relation with clinical and demographic findings. *Acta Med Iran*; 50: 37-42. <https://doi.org/10.1038/pr.2011.371>.
- Anand, A., Disawal, A., Bathwal, P., Bakde, A. (2017). Magnetic Resonance Imaging Brain in the evaluation of pediatric epilepsy. *Int J Sci Stud*; 5: 8-14. doi:10.17354/ijss/2017/547.
- Apolot, D., Erem, G., Nassanga, R., Kiggundu, D., Tumusiime, C. M., Teu, A., Mugisha, A. M. & Sebunya, R. (2022). Brain magnetic resonance imaging findings among children with epilepsy in two urban hospital settings, Kampala-Uganda: a descriptive study. *BMC Med Imaging*, 22(1),175. doi: 10.1186/s12880-022-00901-7. PMID: 36203127; PMCID: PMC9541090.
- Dzefi-Tetty, K., Edzie, E. K., Brakohiapa, E., Kekessie, K., Piersson, A., Acheampong, F., Gorleku, P., Nixon, H., Asemah, A., & Kusodzi, H. (2022). Seizures in children: Spectrum of findings on brain magnetic resonance imaging at the Korle Bu Teaching Hospital, Ghana. *West African Journal of Radiology*, 29 (1), 42–49. https://doi.org/10.4103/wajr.wajr_11_22
- Elmi, A. M., Ibrahim, A. A., Hassan, M. S., Osman, F. A. O., Çelik, C., Dirie, A. M., Ibrahim, I. G. (Jan 2024) Magnetic Resonance Imaging Findings and Their Association with Electroencephalographic Data in Children with Epilepsy at Tertiary Care Hospital in Mogadishu Somalia. *Int J Gen Med*. 23;17:253-261. doi: 10.2147/IJGM.S448291.
- Erinle SA, Thompson MU, Ogunniran SF, Bassey AS, Ifonlaja O (2026). Magnetic Resonance Imaging of the Brain in Children: Indications and Findings in a South-West Nigerian Mission Teaching Hospital. *EAS J Radiol Imaging Technol* 8 (5). DOI: <https://doi.org/10.36349/easjrit.2026.v08i05.003>
- Fernández-Menéndez, A., Casado, A. (2016). Review and update on malformations of cortical development and neuronal migration disorders. *Pediatr Adolescent Med*.;1(1):16. doi: 10.11648/j.pam.20160101.13
- Kalnin, A. J., Fastenau, P. S., deGrauw, T. J., Musick, B. S., Perkins, S. M., Johnson, C. S., Mathews, V. P., Egelhoff, J. C., Dunn, D. W. & Austin, J. K. (2008). *MR Imaging Findings in Children with First Recognized Seizure* *Pediatr Neurol*. 39(6): 404–414. doi: 10.1016/j.pediatrneurol.2008.08.008.
- Khandediya, O. B., Mani, S. S., Kapoor, P. & Singh, V. A. (March 2021). *Spectrum Of MRI Findings in Pediatric Epilepsy – Medical and Surgical Causes of Epilepsy in Children and its’ Radiological Correlation* *ASEAN Journal of Psychiatry* Vol. 22 (2), XX-XX
- Khosronejad, A., Rahimian, E., Raiszadeh, M., Najafizade, S. H., Ranaie, A., Amirsalari, S. (Spring 2022). Magnetic Resonance Imaging Findings in Children with Intractable epilepsy compared to Children with Medically Responsive Epilepsy. *Iran J Child Neurol*. 16(2): 53-61
- Kim JD, Park DW, Eun TK, Chung DH, Hwang TK. Brain (1992). MRI Findings of Complex Partial Seizure in Children. *J Korean Radiol Soc*; 28: 631-638.
- Mellerio C., Labeyrie M. A., Chassoux F., Roca P., Alami O., Plat M., et al. (2014). 3T MRI improves the detection of transmantle sign in type 2 focal cortical dysplasia. *Epilepsia* 55: 117–122. doi: 10.1111/epi.12464..
- Mundhe AS. (2022). Study of role of MRI in evaluation of pediatric epilepsy at a tertiary hospital. *MedPulse Int J Radiol* 21:23–9.
- Mungdala-Odeara V, White S, Otieno GO, Njuguna T, Mturi N, et al. (2008). Prevalence, incidence and risk factors of epilepsy in older children in rural Kenya. *Sci Direct*; 17: 396–404. <http://doi.org/10.1016/j.seizure.2007.11.028>
- NIH (Mar 13, 2026). Epilepsy and Seizures. National Institute of Neurological Disorders and Stroke. <https://www.ninds.nih.gov/health-information/disorders/epilepsy-and-seizures>. Retrieved on October 10, 2026
- Phal P. M., Usmanov A., Nesbit G. M., Anderson J. C., Spencer D., Wang P., et al. (2008). Qualitative comparison of 3-T and 1.5-T MRI in the evaluation of epilepsy. *Am J Roentgenol* 191: 890–895. doi:10.2214/AJR.07.3933.
- Samia, P., Odero, N., Njoroge, M., Ochieng, S., Mavuti, J., Waa, S., & Gwer, S. (Feb 2021). Magnetic Resonance Imaging Findings in Childhood Epilepsy at a Tertiary Hospital in Kenya. *Front Neurol*. 12;12:623960. doi: 10.3389/fneur.2021.623960.
- Suleiman, I. A., Muhammad, I. Z., Samuel, F. S., Olatunji, I. A., Musa, K. S., Hussein, A. T., &

- Muhammed, S. (2025). Spectrum of Brain Magnetic Resonance Imaging Findings in Children with Non-febrile Seizures at Ahmadu Bello University Teaching Hospital, Northwest Nigeria. *Nigerian Journal of Medicine*; 34(3): p 187-193. | DOI: 10.4103/NJM.NJM_52_25
- Wirrell E. Infantile, childhood, and adolescent epilepsies. (2016) CONTINUUM: Lifelong Learning in Neurology. 1;22(1):60-93.
 - Zijlmans M., De Kort G. A., Witkamp T. D., Huiskamp G. M., Seppenwoolde J. H., van Huffelen A. C., *et al*. (2009). 3T versus 1.5T phased-array MRI in the presurgical work-up of patients with partial epilepsy of uncertain focus. *J Magn Reson Imaging* 30: 256– 262. doi:10.1002/jmri.21811.

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