Original Article

Prevalence Of MRI Findings in Patients Presenting With Fits

Iqra Rehman,[1] Hafsa Kiran,[2] M. Usama Hussain,[3] Aks Fatima[4]

Abstract

Objective: to present the clinical and epidemiological characteristics of patients referred for MRI brain due to seizures, along with their corresponding MRI findings.
Study design: It is a descriptive observational study
Place and duration of study: The study was conducted at Radiology department of POF Hospital Wah Cantt.
Material and Methods: Retrospective data from consecutive patients with fits who underwent MRI brain from August 2020 to September 2023 were analyzed (n=536). Patients' data were obtained from the local database and MRI forms. All MRI reports were assessed by Radiologists. Results were analyzed using SPSS-25.
Results: 50.6% (n=271) males and 49.4% (n=265) females were included in the study. 0- 15yrs age group consisted of 40.7% (n=218) patients. Positive MRI findings were found in 67.4% of the patients. Findings in 17.9% of the patients were ischemic changes, in 11.9% of the patients were infections, 8.6% of the patients had neoplasm, out of which gliomas were most common followed by meningiomas, 8.4% patients had hemorrhage and 6% of the patients had congenital diseases. Regarding co-morbidities, 9% patients (n=48) had infections versus 88.6% patients (n=475) with no comorbidity. Majority of the patients 49.4% (n=265) had no other symptom along with fits, while 21.6% (n=116) of the patients had fever along with fits.
Conclusion: MRI is a vital tool for determining the underlying etiology of seizures and directing therapeutic choices. The results of MRI show differences between different age groups.

Keywords: Fits, Seizures, Epilepsy, MRI

1. Introduction

For patients with epilepsy, magnetic resonance imaging (MRI) is the preferred radiological test. Worldwide, fits are a popular reason for magnetic resonance imaging (MRI) of the brain since it is a tried-and-true technique for determining the underlying cause. Current internationally recognized clinical practice states that an MRI should be planned as soon as a fit or seizure occurs.[1,2] Seizures are defined as aberrant electrical activity in the brain. It can alter your consciousness levels as well as your actions, emotions, and movements. At least once in their lifetime, 4% of people will experience this common ailment.[3] Seizures are more common in the age group of 5 to 20 years old, however the disease affects people of all ages.[4,5]

Epilepsy is commonly defined as having multiple episodes of seizures that occur at least twenty-four hours apart and are not associated with a distinguishable cause. There are various types of fits which differ in intensity and symptoms.

Different forms of fits have different origins and spreads throughout the brain. Most seizures last from 30 seconds to 2 minutes. When a fits attack lasts more than five minutes, consider it as an emergency situation.[6]

More often than we would believe, fits occur. Stroke, infections, brain atrophy, ventricular enlargement, leukomalacia/gliosis, gray matter lesions, volume loss, many other white matter lesions, and encephalomalacia are the most frequent brain disorders that cause fits or seizures.[7]

MRI Technologist, POF Hospital,[1] Medical Imaging Technologist, Sapphire Diagnostic Centre,[2] Lecturer Radiology Technology , Iqra National University, Swat Campus,[3] B.Sc. (Hons) Medical Imaging Technology.[4]
Correspondence: Iqra Rehman, MRI Technologist, POF Hospital, Wah Cantt. **Email:** iqra.rehman391@gmail.com

Numerous other conditions affecting the brain and body, such as brain tumors, infections, generalized infections, brain trauma, congenital illnesses, and of course epilepsy, can also be the cause of them. However, the underlying cause of seizures often remains elusive. While most seizure disorders respond well to medication, managing seizures can still significantly impact our daily life. Fortunately, we can work closely with our healthcare providers to strike a balance between medication side effects and effective seizure control.

Pakistan exhibits the highest prevalence of febrile seizures, with lifetime prevalence estimates ranging from 10.9 to 62.8 per 1000 individuals. Epilepsy, or recurring unprovoked seizures or fits, has a lifetime incidence rate of 5.8 to 15.5 per 1000 people.[8,15] Those under 30 years old have the highest frequency. There is a little decline in occurrence between 40 and 59 years of age.

In neurology, MRI is a very sensitive, non-invasive imaging technique.[9,10] It isn't easily accessible and is expensive. Therefore, a thorough assessment of its effectiveness and utility in identifying the underlying etiology of seizures across diverse demographic and clinical subgroups is essential in order to maximize value to the public.[1] In Pakistan, no such assessment has been carried out.

2. Materials & Methods

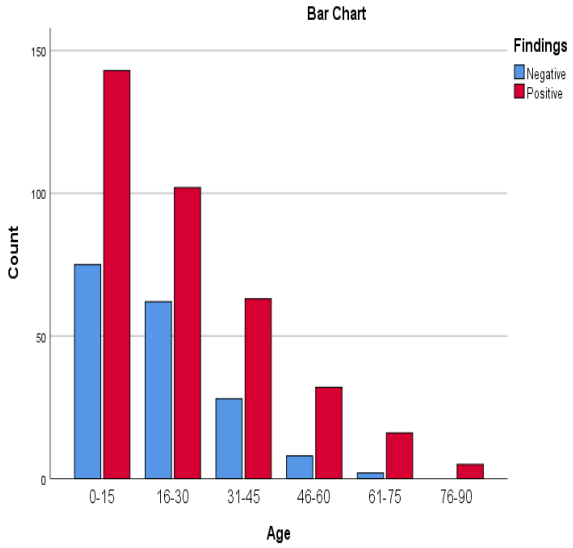
A retrospective, descriptive hospital based observational study was conducted at the department of Radiology POF Hospital Wah Cantt. Data was collected retrospectively after seeking permission of the Head of Radiology Department of POF Hospital. Data of those patients who had undergone MRI Brain examination to rule out the cause of fits was taken. The final diagnosis of the consultant Radiologist was taken. Consecutive patients referred for fits who underwent MRI brain from August 2020 to September 2023 (n=536) were analyzed. Demographic data and clinical information were extracted from the local data base and the patients' MRI requisition forms. Patients with other indications and incomplete data were excluded from study. Patients were referred from many disciplines including general medicine, neuro- surgery, neurology endocrinology and pediatrics. Routine MRI brain protocol consisting of 3 Plane localizer, T2-tse -axial, T2-flair-axial, T1-se-coronal, axial, T2-tse-saggital, T2-tse-coronal, Dwi-epi3trace-axial has been performed in all patients using SEIMENS (MAGNETOM Aera) MRI machine of 1.5 Tesla magnetic field strength. Some patients underwent contrast studies as decided by Radiologists. Histopathology was not followed up in this group. Statistical Package for Social Sciences SPSS version 25 was used to enter and analyze data.

3. Results

Our study population comprised of 536 patients who were presented in the Radiology Department of POF Hospital with the complaint of seizures. Out of 536 patients, 271 were males and 265 were females.

Patients having ages 0-15 year (40.7%) were most common among all the age group to have seizures.

In our study most of the patients with seizures having positive findings were from 0-15year age group. Out of 218 patients from 0-15year age group 143 had positive findings.



MRI findings were positive in 178 males and 183 female patients while 93 males and 82 females were negative.

Table 1: Frequency of Gender with MRI Findings

		Findings		Total
		Negative	Positive	
Gender	Male	93	178	271
	Female	82	183	265
Total		175	361	536

In our study population majority of the patients (49.4%) had no other symptom along with seizures, while 21.6% of the patients had fever along with seizures. Other symptoms were not very common among the study population.

Table 2: Frequency of Associated Symptoms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fever	116	21.6	21.6	21.6
	Body Weakness	17	3.2	3.2	24.8
	Vomiting	14	2.6	2.6	27.4
	Headache	21	3.9	3.9	31.3
	Altered State of Consiousness	17	3.2	3.2	34.5
	Altered Sensorium	21	3.9	3.9	38.4
	Irrelevant Talk	2	.4	.4	38.8
	Others	22	4.1	4.1	42.9
	No other symptoms	265	49.4	49.4	92.4
	Unconsiousness+ Body weakness	1	.2	.2	92.5
	Fever+ Headache	11	2.1	2.1	94.6
	Fever+ Altered Sensorium	6	1.1	1.1	95.7
	Fever+ Body Weakness	6	1.1	1.1	96.8
	Headache+ Vomiting	6	1.1	1.1	97.9
	Fever + Altered Consiousness	5	.9	.9	98.9
	Fever + Vomiting	5	.9	.9	99.8
	Headache + Body weakness	1	.2	.2	100.0
	Total	536	100.0	100.0	

MRI diagnosis of majority of the patients (32.3%) in the study population was normal. While in rest of the patients, the most common cause of seizures was ischemic changes (17.9%). Infections caused seizures in 11.9% of the patients, 8.6% of the patients had neoplasm and 8.4% of the patients had hemorrhage and 6% of the patients had congenital disease. Other conditions were not very common.

Table 3: Frequency of Etiology of Seizures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	173	32.3	32.3	32.3
	Infection	64	11.9	11.9	44.2
	Brain Atrophy	27	5.0	5.0	49.3
	Ischemic changes	96	17.9	17.9	67.2
	Congenital Disease	32	6.0	6.0	73.1
	Hemorrhage	45	8.4	8.4	81.5
	White Matter Disease	17	3.2	3.2	84.7
	Neoplasm	46	8.6	8.6	93.3
	Demyelinating Disease	8	1.5	1.5	94.8
	Infection + Ischemic changes	2	.4	.4	95.1
	Hydrocephalus	5	.9	.9	96.1
	Traumatic changes	2	.4	.4	96.5
	Arachnoid Cyst	2	.4	.4	96.8
	Encephalomalacia	11	2.1	2.1	98.9
	Ischemia +Hemorrhage	3	.6	.6	99.4
	Mesial Temporal Sclerosis	1	.2	.2	99.6
	Posterior Reversible Encephalopathy Syndrome	2	.4	.4	100.0
	Total	536	100.0	100.0	

Analysis of comorbidities showed that 9% of the patients had infections and 0.9% of the patients had congenital/perinatal conditions as a comorbidity. However, the majority (88.6%) had no comorbidity.

Table 4: Frequency of Comorbidities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Perinatal or Congenital	5	.9	.9	.9
	Infections	48	9.0	9.0	9.9
	Metabolic Disorders	3	.6	.6	10.4
	Other Conditions	5	.9	.9	11.4
	No Comorbidity	475	88.6	88.6	100.0
	Total	536	100.0	100.0	

4. Discussion:

In this study, MRI brain shows positive findings in 67.4% of the participants. A study conducted by the Neuroimaging Unit in Florida reported that MRI identified an epileptogenic lesion in 14% of patients with a first seizure, whereas in intractable epilepsy, MRI detected the pathological substrate in 82-86% of cases.[11] The discrepancy in the proportion of patients with positive MRI findings between the two study populations can be attributed to the differing criteria for MRI utilization. In their study, MRI was indicated for the first episode of seizure, while in this study, patients either presented late or underwent other imaging modalities prior to MRI.[11,12]

The prevalence of seizures is higher in the 1–20-year age group[13,14] and this study also found that the most common age group was 0–15 years. In most cases, the cause of seizures remains undetected and is considered idiopathic (70%).[13] This study revealed that 32.6% of the cases were normal with no positive findings, and the 0–15-year age group had a higher probability of a positive MRI finding. In this study different causes of seizures were detected. Among 67.4% patients with abnormal brain MRI, most common causes of seizures detected were ischemia (17.9%), infections (11.9%), neoplasm (8.6%), hemorrhage (8.4%), congenital diseases (6%), brain atrophy (5%). Other less common causes include white matter diseases (3.2%), demyelinating diseases (1.5%), encephalomalacia (2.1%) and others (3.3%). The results of this study were different from the study that was previously conducted at the National Hospital of Sri Lanka in which cerebral neoplasm was detected as the most common cause of seizures.[1] According to this study, encephalitis was the most frequently encountered infection, followed by meningitis. While glioma was the most common tumour found, followed by meningioma in this study population, other less common types include cavernoma, craniopharyngioma, gliomatous cerebri, glioblastoma multiforme and giant cell astrocytoma. In this study congenital diseases that most commonly cause seizures are benign enlargement of subarachnoid spaces (BESS), tuberous sclerosis and focal cortical dysplasia, other less common types include hemimegalencephaly, development venous anomaly, neurofibromatosis, ventriculomegaly, agenesis of corpus callosum, colpocephaly etc.

There was no such statistically significant difference between male (n= 271) and female (n=265) population having the complaint of seizures, however more females have abnormal brain MRI (n=183) than males (n=178).

Majority of the patients in this study population have no other symptom along with seizures (49.4%) while in rest of the patients the most common symptoms that patients had along with seizures is fever. In majority of the patients (n=350) contrast enhanced study was performed, which showed more positive findings than non-contrast enhanced study. In this study population majority of the patients (88.6%) had no comorbidity and 9% had infections as a comorbidity.

Conclusion:

In conclusion, the evaluation of MRI findings in patients with seizures plays a pivotal role in elucidating their underlying etiology. We also observed heterogeneity in MRI findings, which provides valuable insights for MRI interpretation. This information is crucial for refining imaging guidelines and optimizing clinical management strategies.

Limitations:

There were few limitations related to this study. Time was too short to conduct the study. Due to time constraints, we were unable to obtain histopathology reports to corroborate the radiological diagnosis. Data was collected retrospectively that's why seizure type was not evaluated in this study. The results cannot be generalized to the whole population because the data was collected from only one hospital.

References:

1. Pallewatte AS, Alahakoon S, Senanayake G, Bulathsinghela BC. An analysis of MRI findings in patient reffered with fits. Sri Lanka Journal of Radiology. 2015;1: 6-12.
2. Bernasconi A, Cendes F, Theodore WH, Gill RS, Koepp MJ, Hogan RE, Jackson GD, Federico P, Labate A, Vaudano AE, Blümcke I. Recommendations for the use of structural magnetic resonance imaging in the care of patients with epilepsy: a consensus report from the International League Against Epilepsy Neuroimaging Task Force. Epilepsia. 2019 Jun;60(6):1054-68.
3. Beghi E. The epidemiology of epilepsy. Neuroepidemiology. 2020 Dec 18;54(2):185-91.
4. Goldstein LH, Robinson EJ, Reuber M, Chalder T, Callaghan H, Eastwood C, Landau S, McCrone P, Medford N, Mellers JD, Moore M. Characteristics of 698 patients with dissociative seizures: a UK multicenter study. Epilepsia. 2019 Nov;60(11):2182-93.
5. Sen A, Jette N, Husain M, Sander JW. Epilepsy in older people. The Lancet. 2020 Feb 29;395(10225):735-48.
6. Herrera H, Luthen R. Pre-school Child with Seizures. Cases in Pediatric Acute Care: Strengthening Clinical Decision Making. 2020 Apr 15:81-4.
7. Kalnin AJ, Fastenau PS, deGrauw TJ, Musick BS, Perkins SM, Johnson CS, et al. MR imaging findings in children with first recognized seizure. Paediatric Neurology. 2008;39(6): 404-414.
8. Durkin MS, Davidson LL, Hasan ZM, Hasan Z, Hauser WA, Khan N, et al. Paediatric and Perinatal Epidimiology. 1992;6(2): 166-180.
9. Kondapavuluri SK. A study of evaluation of seizure disorder with magnetic resonance imaging in a teritiary care hospital.Journal of Cadiovascular Disease Research.2023
10. Yoganathan K, Malek N, Torzillo E, Paranathala M, Greene J. Neurological update: structural and functional imaging in epilepsy surgery. Journal of Neurology. 2023 May;270(5):2798-808.
11. King MA, Newton MR, Jackson GD, Fitt GJ, Mitchell LA, Silvapulle MJ, et al. Epileptology of the first-seizure presentation: a clinical, electroencephalographic, and magnetic resonance imaging study of 300 consecutive patients. Lancet. 1998;352(9133): 1007-1011.
12. Gamage R. Management of epilepsy. Clinical practice guide lines Sri Lanka. 2013;4: 15-16.
13. Arora V, Nijjar I, Mahajan DS, Sandhu PS, Singh JP, Chopra R. MRI in seizure disorder - a pictorial essay. Indian J Radiol Imaging. 2005;15(3): 331-340.
14. Shih-Hui L. Epidemiology and etiology of seizures and epilepsy in the elderly in Asia. Neurology. 2004;9 (Supplement 1): 31-32
15. Durkin MS, Davidson LL, Hasan ZM, Hasan Z, Hauser WA, Khan N, Paul TJ, Shrout PE, Thorburn MJ, Zaman S. Estimates of the prevalence of childhood seizure disorders in communities where professional resources are scarce: results from Bangladesh, Jamaica and Pakistan. Paediatric and perinatal epidemiology. 1992 Apr;6(2):166-80.