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Research Article

PAEDIATRIC NEUROLOGICAL ILLNESS-NEUROIMAGING CORRELATION-A PROSPECTIVE STUDY

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Abstract

Introduction: Paediatric neurological disorders constitute an important group of diseases that contribute significantly to morbidity and mortality during childhood. The developing nervous system is particularly vulnerable to a wide range of congenital, developmental, infectious, vascular, metabolic, traumatic and neoplastic conditions. Neurological illness in children may present with diverse and often nonspecific clinical manifestations such as seizures, developmental delay, altered sensorium, abnormal head size, headache, weakness, movement disorders, cranial nerve abnormalities and behavioural or cognitive changes. Early recognition and accurate diagnosis of these disorders are essential because many neurological conditions have a significant impact on neurodevelopment, functional independence and quality of life. In this context, neuroimaging plays a central role in identifying structural and functional abnormalities of the developing brain and spinal cord.

Materials and methods: A prospective observational study was conducted over a period of one year at the Department of Paediatrics, Government General Hospital, Kurnool, after obtaining Institutional Ethics Committee approval. A total of 100 children aged 1 month to 15 years presenting with traumatic or non-traumatic neurological complaints and fulfilling the inclusion criteria were enrolled after obtaining informed consent from their parents. Relevant clinical history, examination findings, and neuroimaging findings on CT and/or MRI brain were recorded using a structured case proforma. Data were analysed using SPSS version 26. Continuous variables were analysed using appropriate parametric or non-parametric tests based on distribution, while categorical variables were compared using the chi-square or Fisher's exact test. Multivariate logistic regression was performed to adjust for potential confounders. A two-tailed p-value <0.05 was considered statistically significant.

Results: Among the 100 children included in the study, 25 (25%) were aged 1 month–12 months, 43 (43%) were aged 1–5 years, and 32 (32%) were aged 5–12 years**,** with the 1–5-year age group being the predominant group. There was a male predominance, with 59 (59%) males and 41 (41%) females. The majority of children were from rural areas (82%)**,** while 18%

were from urban areas. Among the 100 children, 66 (66%) presented with generalized-onset seizures and 34 (34%) with focal-onset seizures**.** Among generalized seizures, GTCS was the most common type, accounting for 40 (40%) cases, followed by tonic seizures (15%), myoclonic seizures (4%), epileptic spasms (4%), clonic seizures (3%), absence seizures (2%), and atonic seizures (1%). Among focal seizures, simple partial seizures were predominant, comprising 27 (79.41%) cases, while complex partial seizures accounted for 7 (20.59%) cases. MRI brain was abnormal in 57 (57%) children and normal in 43 (43%). Among children with focal seizures, the commonest MRI abnormality was cysticercal granuloma (8%)**,** followed by hypoxic-ischaemic changes (7%), tuberculoma (3%), infarction (3%), and other abnormalities. Importantly, MRI abnormalities were significantly more frequent among children with focal-onset seizures (30/34; 88.24%) compared with those having generalized-onset seizures (32/66; 48.48%), and this difference was statistically highly significant ($p < 0.00001$)**,** demonstrating a strong association between focal seizure onset and abnormal MRI findings.

Conclusion: Seizures are a common presentation in the Pediatric emergency departments in developing countries. Based on clinical presentation and investigations, etiological cause can be identified to a large extent and this helps in initiating appropriate treatment at the appropriate time to reduce the morbidity and mortality. Our study, done in a tertiary care hospital in a urban setting, provides a baseline clinical profile of seizures in the population and shows the importance of neuroimaging in diagnosing the etiology, with more abnormalities being detected in the focal seizure groups than generalized seizures. High resolution neuroimaging modalities need to be installed in tertiary care hospitals for quicker and accurate diagnosis.

Key Words: Paediatric neurological disorders; Seizures; Focal seizures; Generalized seizures; MRI brain

INTRODUCTION

Every day in our paediatrics department, number of children admitted with different neurological complaints like seizures, headache, weakness, focal neurological deficit, altered sensorium, gait disorders etc. For proper diagnosis like CNS infection, structured brain anomalies, metabolic, demyelinated disorders, neurodegenerative illness etc. apart from history and through clinical examination, these children required neuroimaging in form of CT scan and MRI scan for accurate diagnosis of illness. Aften we narrow down different treatment strategy based on NI findings.[1]

Paediatric neurological disorders constitute an important group of diseases that contribute significantly to morbidity and mortality during childhood. The developing nervous system is particularly vulnerable to a wide range of congenital, developmental, infectious, vascular, metabolic, traumatic and neoplastic conditions. Neurological illness in children may present with diverse and often nonspecific clinical manifestations such as seizures, developmental delay, altered sensorium, abnormal head size, headache, weakness, movement disorders, cranial nerve abnormalities and behavioural or cognitive changes. Early recognition and accurate diagnosis of these disorders are essential because many neurological conditions have a significant impact on neurodevelopment, functional independence and quality of life. In this context, neuroimaging plays a central role in identifying structural and functional abnormalities of the developing brain and spinal cord.[2]

The clinical evaluation of a child with suspected neurological disease requires

careful correlation between the history, neurological examination, laboratory investigations and imaging findings. However, clinical manifestations alone may not always accurately indicate the underlying anatomical abnormality. Neuroimaging provides a means of visualizing the central nervous system and can help establish the location, extent, nature and severity of disease. Advances in imaging technology have considerably improved the ability to diagnose paediatric neurological disorders at an early stage and have also contributed to improved treatment planning and prognostication.[3]

Conventional radiography has a limited role in the evaluation of intracranial neurological disease, whereas ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI) have become important modalities in paediatric neuroimaging. Cranial ultrasonography is particularly useful in neonates and young infants with open fontanelles.[4] It is a relatively inexpensive, portable and radiation-free technique that can be used for the detection of intracranial haemorrhage, hydrocephalus, periventricular abnormalities and certain congenital brain lesions. Its major limitation is the restricted acoustic window after closure of the fontanelles and its relatively limited ability to demonstrate abnormalities involving structures that are poorly visualized through the available acoustic windows.[5]

AIM

To determine the correlation of clinical manifestations and neuro imaging findings observed in different neurological illness.

OBJECTIVES

1. To determine how frequently neuro imaging aids in diagnosis.
2. To determine clinical correlation between clinical manifestations and observed in NI findings.
3. To determine correlation between observed NI findings and outcome.

MATERIALS AND METHODS

Source of data: Children of 1 month to 15 years age in GGH, Kurnool who admitted in department of paediatrics with traumatic and non traumatic neurological complaints

Study period: 1 year from date of approved institutional ethical committee Study design: Prospective observational study

Sample size: 100

Inclusion criteria: Children of 1 month to 15 years who admitted with neurological complaints according to classification of ICD 10 and WHO under merit neuro imaging in form of CT and MRI.

Exclusion criteria: Age <1 month, Parents of children admitted who are not willing to give informed consent and not willing to participate in study.

Methodology

After obtaining permission from ethical committee we will start study after taking informed consent from parents of children admitted with neurological complaints in dept of pediatrics GGH, Kurnool according to ICD classification 10. We will collect data by proper history, and recording of clinical examination findings, neuro imaging findings who underwent CT or MRI brain in case sheet proforma. After collection of data from sufficient samples the results will be analysed using appropriate statistical method.

Data analysis was conducted using SPSS version 26. Continuous variables were assessed for normality using the Shapiro–Wilk test. Depending on distribution, appropriate parametric (e.g., Student's t-test) or non-parametric (e.g., Mann Whitney U test) tests were applied. Categorical variables were compared using the chi-square test or Fisher's exact test when expected cell frequencies were <5. Multivariate logistic regression was performed to adjust for potential

confounders. A p-value of <0.05 (two-tailed) was considered statistically significant.

RESULTS

Among the 100 children included in the study, 25 (25%) were aged 1 month–12 months, 43 (43%) were aged 1–5 years, and 32 (32%) were aged 5–12 years**,** with the 1–5-year age group being the predominant group. There was a male predominance, with 59 (59%) males and 41 (41%) females. The majority of children were from rural areas (82%)**,** while 18% were from urban areas. Among the 100 children, 66 (66%) presented with generalized-onset seizures and 34 (34%) with focal-onset seizures**.** Among generalized seizures, GTCS was the most common type, accounting for 40 (40%) cases, followed by tonic seizures (15%), myoclonic seizures (4%), epileptic spasms (4%), clonic seizures (3%), absence seizures (2%), and atonic seizures (1%). Among focal seizures, simple partial seizures were predominant, comprising 27 (79.41%) cases, while complex partial seizures accounted for 7 (20.59%) cases. MRI brain was abnormal in 57 (57%) children and normal in 43 (43%). Among children with focal seizures, the commonest MRI abnormality was cysticercal granuloma (8%)**,** followed by hypoxic-ischaemic changes (7%), tuberculoma (3%), infarction (3%), and other abnormalities. Importantly, MRI abnormalities were significantly more frequent among children with focal-onset seizures (30/34; 88.24%) compared with those having generalized-onset seizures (32/66; 48.48%), and this difference was statistically highly significant ($p < 0.00001$)**,** demonstrating a strong association between focal seizure onset and abnormal MRI findings

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Age	Number of patients	Percentage
1 m - 12 months	25	25%
1 year- 5 years	43	43%
5 years-12 years	32	32%

Table 1: Distribution of study participants according to age

Gender	Number of patients	Percentage
Male	59	59%
Female	41	41%
Total	100	100%

Table 2: Gender distribution

Residence	Number of patients	Percentage
Rural	82	82%
Urban	18	18%
Total	100	100%

Table 3: Residence

Types of generalized seizures	Number of patients	Percentage
GTCS	40	40%

Tonic	15	15%
Clonic	3	3%
Absence	2	2%
Atonic	1	1%
Myoclonic	4	4%
Epileptic spasm	4	4%

Table 4: Types of generalized seizures (66)

Types of focal seizures	Number of patients	Percentage
Simple Partial Seizures (SPS)	27	79.41%
Complex Partial Seizures (CPS)	7	20.59%

Table 5: Types of focal seizures (n=34)

Variable		Number of patients	Percentage
MRI (n=100)	Abnormal	57	57%
	Normal	43	43%
MRI findings in focal seizures (n=34)	Focal cortical dysplasia	1	1%
	Hypoxic ischaemic Changes	7	7%
	Cysticercal granuloma	8	8%
	Tuberculoma	3	3%
	Kernicterus	1	1%
	Infarct	3	3%
	Cortical sinus venous Thrombosis	1	1%
	Normal	7	7%
	Others	2	2%

Table 6: Distribution of Neuroimaging (MRI brain findings)

MRI	Focal onset	Generalized onset	P value
Abnormal	30 (88.24%)	32 (48.48%)	<0.00001
Total	34	66	

Table 7: Comparison of MRI abnormality between focal and generalized onset seizure groups

DISCUSSION

Neurological disorders constitute an important cause of morbidity in children and may present with a wide spectrum of clinical

manifestations ranging from seizures and altered sensorium to focal neurological deficits and traumatic brain injury.[6] Clinical assessment remains the cornerstone of diagnosis; however, neuroimaging plays an important role in identifying structural abnormalities and establishing the underlying cause.[7]

The present study was undertaken to assess the correlation between clinical neurological illness and neuroimaging findings in children aged 1 month to 15 years admitted to the Department of Paediatrics, Government General Hospital, Kurnool.

In the present study, 59 % of the children were males and 41% were females**,** with a male predominance. This male predominance may be related to the higher incidence of traumatic neurological conditions among girls as well as differences in healthcare-seeking behaviour. Similar male predominance has been reported in several paediatric neurological and neuroimaging studies.[8]

The current study showed that most of the patients belonged to the age group of 1 year to 5 years with a male predominance. The findings are broadly in agreement with most of the studies conducted previously. Maximum patients hailed from rural areas which could be due to the the fact that the study was conducted in a tertiary care hospital which caters mainly, to the rural population of three districts of Eastern India. Majority of the study population (66%) had generalized seizures while 34% of the patients had focal convulsions. Generalized Tonic Clonic Seizures (40%) accounted for the majority of the cases of generalized seizures, followed by tonic seizures (15%). Clonic seizures, absence seizures, atonic seizures, epileptic spasms and myoclonic seizures accounted for the rest.[9]

Among the patients having focal seizures, 79.41% had simple partial seizure (SPS) and 20.59% (n=7/34) had complex partial seizures (CPS). The sex wise distribution of the two seizure groups showed that generalized seizures were more common in both males and females. However the tests of significance conducted for the two seizure types between both the sexes were statistically insignificant. Generalized seizures were reported as more common than focal seizures in almost all of the previous studies with generalized tonic clonic seizure being the predominant type.[10]

Predominance of generalized epilepsies can be possibly attributed to the fact that they are more theatrical and hence, more likely to be noticed and brought to medical attention.

CONCLUSION

Seizures are a common presentation in the Pediatric emergency departments in developing countries. Based on clinical presentation and investigations, etiological cause can be identified to a large extent and this helps in initiating appropriate treatment at the appropriate time to reduce the morbidity and mortality. Our study, done in a tertiary care hospital in a urban setting, provides a baseline clinical profile of seizures in the population and shows the importance of neuroimaging in diagnosing the etiology, with more abnormalities being detected in the focal seizure groups than

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