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MRI findings in children with global developmental delay

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Abstract
Aim and objective: To determine the prevalence of abnormal brain MRI in children aged 2mon to 12yrs with Global developmental delay.
Methods: This is a prospective observational study where a total of 42 children aged 6 month to 12 years with developmental delay who underwent MRI imaging of brain during the study period were included. All patients were evaluated clinically and underwent an MRI of the brain performed using a 1.5 Tesla MRI scanner. MRI scan was done and findings are recorded. Datas were collected and analyzed statistically.
Results: Out of 42 children with developmental delay, 52.4% (n=22) were female and 47.6% (n=20) were male children. About 61.9% (n=26) of children with developmental delay had abnormal findings in MRI. All the children with developmental delay have shown abnormal findings in EEG. Among 26 children with abnormal MRI findings, 6 children (23.1%) had hypoxic ischemic changes, 6 children (23.1%) had white matter disorders, 6 children (23.1%) had atropic changes, infection associated changes (n=2), congenital malformations (n=3), two children (7.7%) had CSF disorders and one child (3.8%) had chronic MCA infarct.
Conclusion: Though the specific cause of developmental delay often remains unknown, MRI provides useful diagnostic information in a relatively high percentage of children resistant to diagnosis by nonimaging methods.

Keywords: developmental delay, magnetic resonance imaging (MRI)

Introduction
Global developmental delay (GDD) is a subset of developmental disorders that is defined as a significant delay or below the appropriate standard in two or more developmental domains. It may occur due to static or progressive disorders in the central nervous system. In the patients with these disorders, regression, stability, or disease progression may develop. The main causes of delay in development include a range of various diseases from which the large number associate with specific findings in brain MRI. These causes cannot be identified only based on physical examination or patient history; however, additional studies like genetic analysis, metabolic, serological, strip brain, and neuroimaging are required. Neuroimaging provides important information as evidence of previous injuries, specific abnormalities that would indicate a group or a particular disease [1, 2, 3].

Materials and Methods
This is a hospital based prospective observational study done in children aged 6months to 12 years with developmental delay admitted in Government Mohan kumaramangalam Medical College &Hospital during October 2018 and October 2019.

Inclusion Criteria: All children aged 6month to 12 years with Global developmental delay who underwent MRI imaging of brain during the study period

Exclusion Criteria: The children with GDD who have been admitted without brain MRI had been excluded and the children who have been admitted several times for various reasons have been considered only once.
All children who satisfied the inclusion criteria were included in the study after getting informed written consent from the parents. The data regarding their name, age, sex, address

with development history and family history are collected in a preformed proforma. All patients will be evaluated clinically and then undergo an MRI of the brain performed using a 1.5 Tesla MRI scanner. Routine spin echo T1, T2 and Inversion recovery sequences are followed by a T1 weighted high resolution magnetization prepared rapid gradient echo sequence (MPRAGE) and a high resolution inversion recovery (IR) sequence both obtained in an oblique coronal plane perpendicular to the hippocampus. MRI scan was done and findings are recorded. Datas were collected and analyzed statistically.

Results:

Table 1: Sex Distribution of Children with Developmental Delay

Sex	Development Delay (DD)	
	Number	Percentage
Male	20	47.6%
Female	22	52.4%
Total	42	100

Table 2: MRI Findings in Children with Developmental Delay

MRI Findings	Development Delay (DD)	
	Number	Percentage
Normal	16	38.1
Abnormal	26	61.9
Total	42	100

Table 3: EEG Findings in Children with Developmental Delay

EEG Findings	Development Delay (DD)	
	Number	Percentage
Normal	-	-
Abnormal	39	100
Total	39	100

Table 4: MRI Findings of Children with Developmental Delay

MRI Diagnosis	Development Delay (DD)	
	Number	Percentage
HIE	6	23.1
Infection	2	7.7
Cong. Malformation	3	11.5
White Matter Disorders	6	23.1
CSF Disorder	2	7.7
Vascular Lesions	1	3.8
Atrophic Changes	6	23.1
Tumour	-	-
Total	26	100

Discussion

Out of 42 children with developmental delay, 52.4% (n=22) were female and 47.6% (n=20) were male children.

About 61.9% (n=26) of children with developmental delay have abnormal findings in MRI whereas 38.1% (n=16) of children with developmental delay have normal findings in MRI.

The EEG was performed for 39 children with developmental delay. For 3 children with developmental delay, EEG was not done. All the children (100%) with developmental delay have shown abnormal findings in EEG.

Among 26 children with abnormal MRI findings, 6 children (23.1%) had hypoxic ischemic changes, 6 children (23.1%) had white matter disorders including, metabolic encephalopathy (Canavan. Disease, n=2), delayed/hypomyelination (n=4) and another 6 children (23.1%) had atropic changes that included Dyke Davidoff Mason Syndrome (n=1), B/L temporal lobe atrophy (n=1).

Other MRI findings in children with developmental delay were infection associated changes (n=2) that included Tuberculoma and terminal zone myelitis, congenital malformations (n=3) including heterotropia, pachygyria and corpus callosal agenesis with Dandy Walker malformation. Two children (7.7%) had CSF disorders (cistern magna, communicating hydrocephalus) and one child (3.8%) had chronic MCA infarct.

Statistically differences were reported in various studies such as Bouhadiba *et al*. [4] who conducted a study on 224 children with developmental delay and observed 109 cases (48.6%) with positive findings in brain MRI from whom 55 cases had structural anomalies of the brain. Another study in Korea on 34 children with GDD, 26 cases (76.5%) had significant abnormal findings on brain MRI [5]. In a study by Ali Akbar *et al*. [6], among 580 children with developmental delay, brain MRI findings in 240 cases (41.4%) were reported normal and the rest 340 cases (58.6%) showed abnormal pattern.

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