



ROLE OF MRI BRAIN IN DEVELOPMENTAL DELAY IN CHILDREN

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ABSTRACT**Introduction-** Developmental delay is diagnosed when there is delay in features of development such as gross motor, fine motor, speech and language, cognition and social/personal development.

Etiology of developmental delay has a spectrum from specific diseases to sequelae of ischaemic insult and magnetic resonance imaging is the modality of choice.

Aim- To study MRI findings in children with developmental delay.**Material And Method-** Imaging studies of 30 developmentally delayed children between age 2 month to 15 years who were referred to the department of radio diagnosis for MRI brain.**Results-** Of the 30 children abnormal findings were present in 19 of which most of them had features sequelae to ischaemia. Normal MRI findings were seen in 11 cases.**Discussion-** MRI is the modality of choice for study of developmental delay.**Conclusion-** MRI brain study is an effective and non ionizing tool in identifying children with developmental delay.**KEYWORDS :** MRI brain, developmental delay**INTRODUCTION-**

Developmental delay is among the commonest problem encountered in community pediatric practice. Development is a complex and ongoing process that starts from conception and continues throughout adulthood, influencing many aspects of life. Individual skills are built and combined to generate even more sophisticated achievements such as walking, speaking, playing, thinking and communication (1).

Developmental delay is defined as significant delay in one or more developmental domains. Myelination and synapses are the causes of this phase of growth and have been extensively studied. Any delay in neurodevelopment possibly has a biological connection. The correlation between myelination and synapse can be studied using neuroimaging techniques particularly MRI. (2)

Overall, in the first five years of age group about 200 million children have not achieved their developmental potential due to poverty, ill health, nutrition, and lack of early stimulation.(1)According to the WHO, there is a developmental delay or impaired development in about 5 percent of children under the age of 14 years.(3)In India, the prevalence of developmental delay among those below 2 years of age is around 2%. (4)

Magnetic Resonance Imaging (MRI) is the best modality to investigate such patients. (5) The study was taken to rationalize and to investigate such children, primarily in an attempt to identify causation, but also to assist the management and to provide prognosis.

The aims and objective of the study were to identify the MRI brain findings in children with developmental delay. To categorize them into normal and abnormal findings. And to further categorize abnormal MRI findings.

MATERIALS AND METHODS-

An observational and descriptive study of MRI the brain was performed in the department of radio-diagnosis, Himalayan Institute of Medical Sciences (HIMS), Swami Ram Nagar, Dehradun, over 36 months. A minimum of 30 patients were included in the study. Both outpatients and inpatients were included. After taking a proper written informed consent, permission from the ethical committee, complete history and clinical examination was done and these patients were subjected to MRI brain. Clinical and radiological data from the study was recorded as per the proforma.

Inclusion Criteria-

Children of age 2 months to 15 years with developmental delay who

were asked for MRI brain to be done to determine the cause of developmental delay.

Exclusion Criteria:

Children age < 2 months and > 15 years

- Patients with diagnosed cases like Turner' syndrome, Down syndrome, metabolic disorders like scurvy, rickets, and protein energy malnutrition, infections like pneumonia, and any other communicable diseases in the stage.
- Contraindications to MRI-claustrophobia, cochlear implants.
- Brain injury history and with non-cooperative conditions.

All the patients with developmental delay were subjected toMRI examination using a 1.5 Tesla MR system Magnetom Avanto (Seimens Healthcare, Germany). Structured case reporting was used to generate data.

Sequences used were : Routine MRI brain sequence of an axial T1, T2 weighted Axial and coronal , FLAIR, DWI and ADC images.

The MRI scan were performed under the supervision of a qualified Radiologist in the workstation. The findings were classified accordingly into following categories.

I. Normal

ii. Non-specific findings like cavumvergae, ventriculomegaly, cavum septum pellucidum, prominent), prominent cisterna magna, Virchow-Robin spaces (VRS) etc.

iii. Neurovascular/Traumatic diseases including periventricular leukomalacia, encephalomalacia hypoxic -ischemic injury, gliosis, atrophy etc.

iv. Developmental and Congenital disorders includes corpus callosum agenesis, chiari malformation, agyria/pachygyria etc.

v. Neoplastic disease includes medulloblastoma, pilocytic astrocytoma and teratoma.

vi. Metabolic and neurodegenerative causes including white matter and ventricle related abnormality, cerebral atrophy , cerebral pontinemyelinosis.

RESULTS-

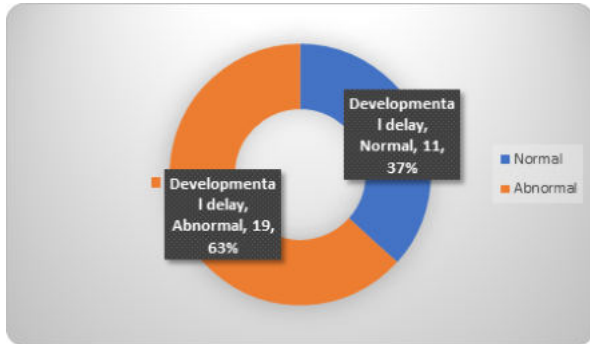


Figure 1: Pie Diagram Showing MRI Findings In Children Developmental Delay.

Out of total 30 cases, 11 cases (37%) cases were normal and 19 cases (63%) were abnormal in cases of developmental delay in our study.

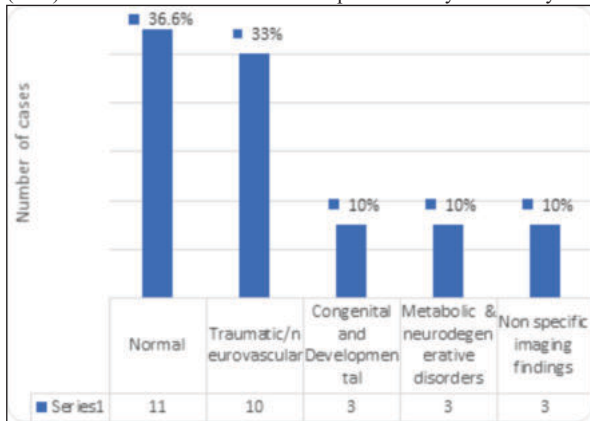


Figure 2 : Bar Diagram Showing Categorization Of MRI Findings

In 11 cases (37 percent), etiological categorization showed normal brain MRI. The remaining 19 cases were also classified as an abnormal MRI, out of which 10 cases (33 percent) had findings associated as Neurovascular diseases. The percentage of children with congenital and developmental disabilities were 3 cases (10 %).Metabolic & neurodegenerative diseases and non specific MRI outcomes were seen in 3 cases each (10%).

Table-I: Details Of Post-natal History In Cases Of Developmental Delay

History of seizure	Number of cases	Percentages
Yes	11	37
No	19	63

History of seizure was seen in 37% of cases who presented to the department with developmental delay.

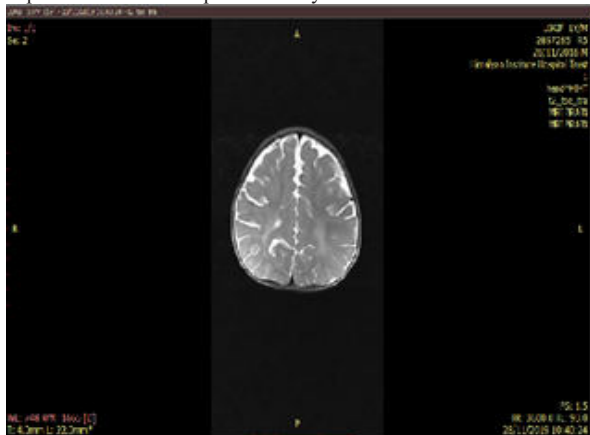


Figure 3:T2 Weighted Axial Scans Of MRI brain: Hyperintensities involving the bilateral centrum semi-ovale-Periventricular leucomalacia.



Figure 4: T2 weighted axial scans of MRI brain: Decrease in periventricular white matter with smooth indentations on bilateral lateral ventricles-Sequelae to HIE.

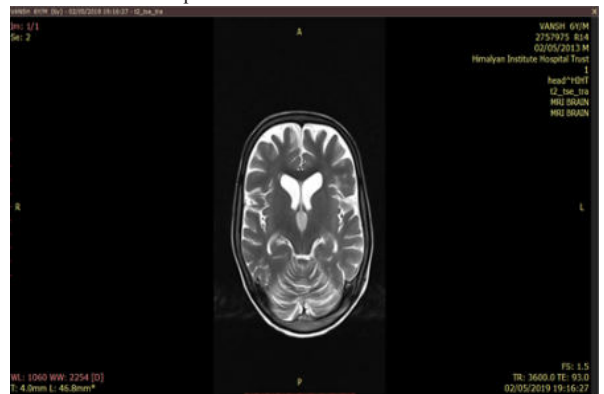


Figure 5: T2 weighted axial scans of MRI brain: Mild to moderate dilatation of ventricular system, prominent cortical sulci on both sides, bilateral cerebellar folia are prominent-Diffuse cerebral and cerebellar atrophy.

DISCUSSION-

Developmental disorders pose a major issue in pediatric treatment and a common cause for referral to sub-specialists in developmental or neurology. The present study was prospectively conducted in 30 consecutive patients presenting for developmental delay assessment at tertiary hospital. Radiological observations were made with particular reference to the MRI research.

In our study 11 cases (37%) cases were normal and 19 cases (63%) were abnormal in cases of developmental delay (Figure-1). This has been contrasted with other related literary studies. The proportion of children with an abnormal MRI in Ali et al (5) sample was 68percent. Other reports, including Momen et al (6), Widjaja et al (7) and Koul et al (8), showed the following percentage of children with abnormal MRI were 59%, 84%, and 81%, respectively.

In our study out of 30 cases 19 cases had abnormal MRI, which were classified into neurovascular diseases 10cases (33%), congenital and developmental disabilities 3 cases (10%), Metabolic & neurodegenerative diseases 3 cases (10%) and nonspecific 3 cases (10%) (Figure-2) and normal findings in 11 cases(36.6%) our study was in similarity with the study done by Althaf Ali et al (5) that the most common abnormality encountered were Neurovascular diseases like hypoxic ischemic encephalopathy (31%), study reported a slightly higher percentage of children in this category (50%). The rest of the categories were comparable to the above-mentioned study. Neurovascular disorders, which accounted for approximately 38 percent of the total cases, were the most prevalent categorical abnormality in a report by Momen et al (6). This would have been comparable with our research.

CONCLUSION-

MR imaging is an important part of the systematic assessment of children with developmental delay, as it is simple to identify many particular etiological and pathophysiological factors that contribute to

developmental delay. Neuroimaging provides important information as evidence of previous injuries, specific abnormalities that would indicate a group or a particular disease.

In most if not all cases, thorough examination of the MRI helps to establish the possible etiology. MRI brain research aids the clinician in careful diagnosis leading to adequate care and therapy of the patients. The clinicians and the child's parents found MR helpful in confirming a physical basis for retardation, seizures and other neurological findings. MR was also useful in counselling the parents.

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