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# MRI Patterns of Hypoxic Ischemic Injury in Preterm and Term Neonates

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**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

## Abstract

**Introduction:** Hypoxic Ischemic encephalopathy remains most important and common neurological disease especially in perinatal period across all gestational ages.

**Materials and methods:** Present Cross sectional Study was conducted in the Department Of Radiodiagnosis , JJM Medical College , Davangere , Karnataka , India in a period of one & half year. Prior to the commencement of the study, the ethical clearance was obtained from the Ethics Committee, JJM Medical College , Davangere.

All the patients fulfilling the selection criteria were explained about the purpose of study and a written informed consent was obtained to participate in the study before enrolment.

**Results:** In our present study out of 75 patients, the preterm infants had a basal ganglia – thalamus pattern while the predominant type of injury in term infants was watershed. Diffusion restriction was present in most of the neonatal brains.

**Conclusion:** The role of MRI is in excluding structural anomalies and mainly in assessing the extent and nature of injury. Thereby, it helps in prognosticating the outcome and planning neurodevelopmental therapy.

**Keywords:** MRI, Basal Ganglia, Physio-Psycho.

## Introduction

Insufficient cerebral blood flow (ischemia) and decreased oxygenation in the blood (hypoxia) lead to loss of normal cerebral autoregulation. This results in diffuse brain injury and thereby causes hypoxic–ischemic encephalopathy (HIE). Studies shows that, Neonatal hypoxic ischemic encephalopathy occurs in 1.5/1000 live births. The incidence of HIE is 2.5 per 1000 non-anomalous term live births and approximately 7 per 1000 preterm births. The pattern of brain injury depends on the severity and duration of hypoxia and

degree of brain maturation. The imaging findings in full term neonates (> 36 weeks of gestation) may differ from those in preterm neonates (< 36 weeks of gestation).

**Materials and methods**

Present Cross sectional Study was conducted in the Department of Radiology, JJM Medical College , Davangere in a period of one & half year. Prior to the commencement of the study, the ethical clearance was obtained from the Ethics Committee, JJM Medical College , Davangere.

All the patients fulfilling the selection criteria were explained about the purpose of study and a written informed consent was obtained to participate in the study before enrolment.

**Inclusion criteria:** All the children attending Bapuji hospital with clinical suspicion of Hypoxic Ischemic Injury.

**Exclusion criteria:** Neonates with metabolic disorders, tumors, congenital malformations/infections and genetic abnormalities.

**Preparation**

- History and physical examination of all patients was performed.
- Patients were asked to remove all ornaments & metallic accessories.
- Attenders were explained about the technique.

**Technique**

- All the patients underwent MRI scanning at our department on Philips Achieva 1.5 Tesla.
- Patient was placed supine on the table and the area from the vertex to the skull base was included.
- MRI Brain was performed with T1, T2, FLAIR, T2* & Diffusion sequences.

**Results**

Chart 1: Distribution of study group according to Sex

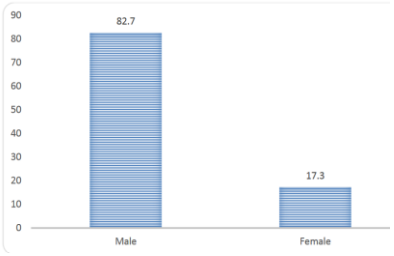



Chart 2: Distribution of study group according to Birth weight

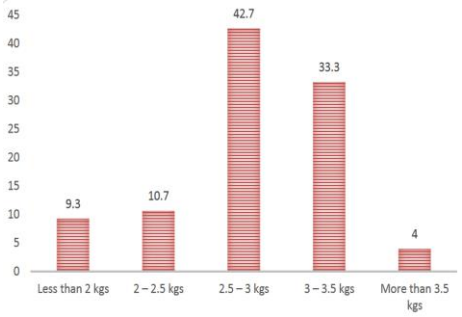



Chart 3: Distribution of study group according to Age at delivery

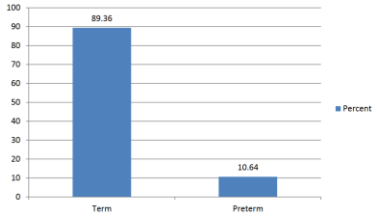



Chart 4: Distribution of study group according to Mode of delivery

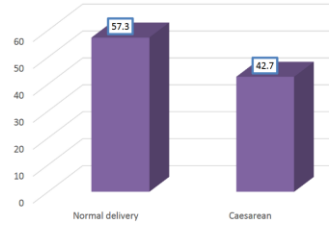


Chart 5: Distribution of study group according to APGAR Score at 1 minute

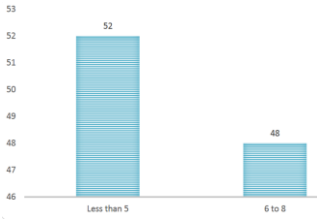



Chart 6: Distribution of study group according to APGAR Score at 5 minute

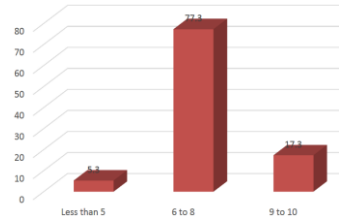



Chart 7: Distribution of study group according to Resuscitation

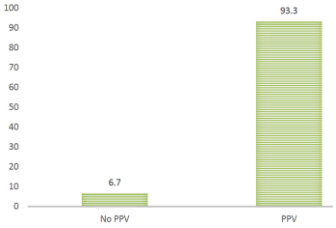



Chart 8: Distribution of study group according to Neonatal seizures

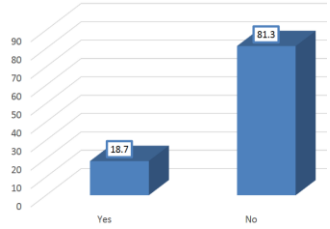



Chart 9: Distribution of study group according to Meconium Aspiration

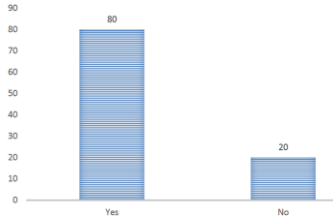



Chart 10: Distribution of study group according to Hypoglycaemia

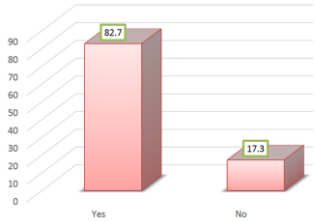



Chart 11: Distribution of study group according to Clinical HIE

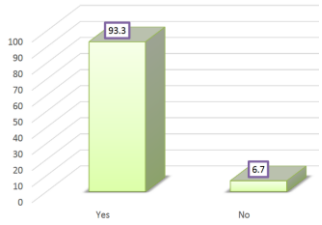



Chart 12: Distribution of study group according to Cerebral edema

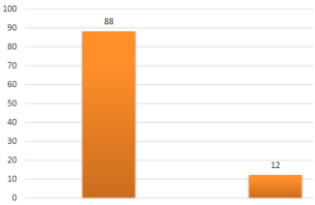



Chart 13: Distribution of study group according to Basal ganglia findings

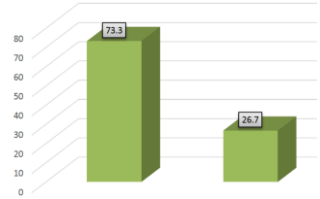


Chart 14: Distribution of study group according to Thalamus findings

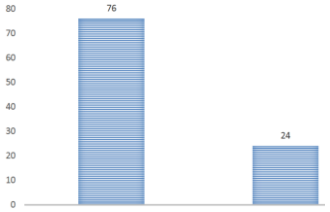



Chart 15: Distribution of study group according to Posterior Limb of Internal Capsule (PLIC) findings

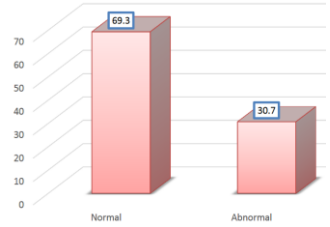



Chart 16: Distribution of study group according to Cortical highlighting

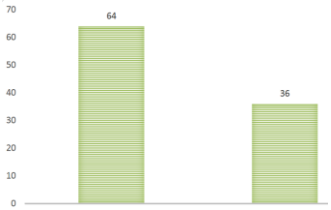



Chart 17: Distribution of study group according to White matter

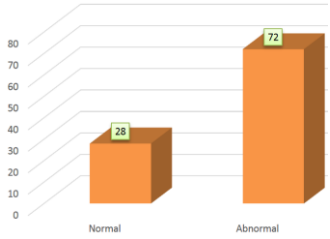



Chart 18: Distribution of study group according to Grey-White matter

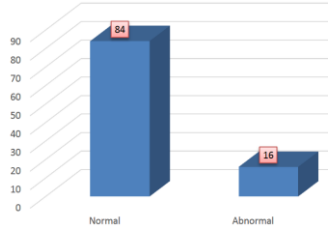



Chart 19: Distribution of study group according to Brainstem findings

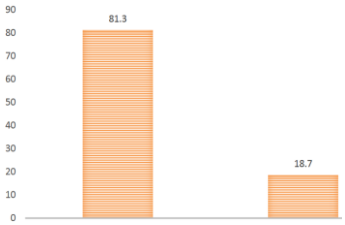
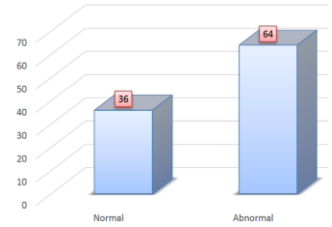



Chart 20: Distribution of study group according to Diffusion Restriction




**Discussion**

Seventy five cases of HIE were studied.

About 82.7% of the cases in this study were male. 65% of the cases presented with watershed predominant and 56% with basal ganglia/ thalamus predominant. About 42.7% of the cases had birth weight of 2.5 – 3 kgs in this study. The mean birth weight was 3.5 kgs in normal babies, 3.2 kgs in cases with watershed predominant lesions and 3.4 kgs in basal ganglia/ thalamus predominant cases. About 89.3% of the new borns were term babies. About 57.3% of the new borns were born by normal delivery and 42.7% by caesarean section. The APGAR score was less than 5 in 52.0% of the cases and 6 to 8 in 48.0% of the cases. The APGAR score was between 6 to 8 in 77.3% of the cases 9 to 10 in 17.3% of the cases and less than 5 in 5.3% of the cases. No positive pressure ventilation was given in 6.7% of the cases and positive pressure ventilation was given in 93.3% of the cases. Neonatal seizures was present in 18.7% of the cases in this study. Meconium aspiration was present in 80.0% of the cases and absent in 20.0% of

the cases. Hypoxic ischemic encephalopathy was present in 93.3% of the cases. Cerebral edema was present in 12.0% of the cases in this study. Basal ganglia was abnormal in 26.7% of the cases. Abnormal findings in thalamus was noted in 24.0% of the cases. The PLIC was abnormal in 30.7% of the case. Periventricular leukomalacia was present in 27.1% of the cases. Cortical highlighting was noted in 36.0% of the cases. The white matter was abnormal in 72.0% and grey, white matter was abnormal in 16.0% of the cases. Brain stem findings were abnormal in 18.7% of the case. The diffusion restriction was abnormal in 64.0% of the cases.

**Conclusion**

MRI has emerged as an important investigation in assessment of prognosis of neonates with hypoxic ischemic encephalopathy. The role of MRI is in excluding structural anomalies and mainly in assessing the extent and nature of injury. Thereby, it helps in prognosticating the outcome and planning neurodevelopmental therapy. Early recognition of the severity of the condition is crucial in predicting the probable neurological outcome as well as for deciding the need for stimulation therapy for the physico – psycho – social development of the infant.

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