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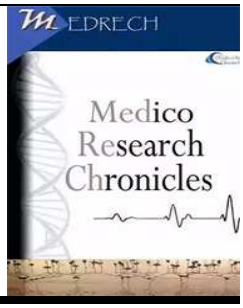

Spectrum of neurological disorders in children with neonatal hypoglycemia of western rural Maharashtra.

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ABSTRACT

Background*:* Glucose is an essential metabolic fuel for the brain, and in the newborn the proportionately large brain accounts for almost all of total tissue glucose requirements. Neonatal hypoglycemia is not timely and properly treated, the infants may develop permanent brain injury. Persistent or recurrent hypoglycemia may lead to long-term visual disturbance, hearing impairment, cognitive abnormalities, secondary epilepsy, and other disorders in the central nervous system.
Aims and objectives: To study the clinical profile of hypoglycemia in high-risk newborns, as well as neurological squeal.
Methods: This is a descriptive cross sectional study was conducted at the department of pediatrics, Dr. Vitthalrao Vikhe Patil Pravara Rural hospital Loni, Maharastra, India, performed on children aged 3 months to 12 years coming to Paediatrics neurology OPD from Feb 2022 to Dec 2023.
Results: Out of 60 patients 31(51.6%) presented with seizures. Global developmental delay is found in children, out of which - gross motor delay in 28 (46.67%), fine motor delay in 29(48.33%), social milestone delay in 18(30%) and language mile stone delay in 18(30%) children. 6 (10%)children had autism spectrum disorders. Vision impairment is seen in 36(60%) cases which have significant p value of 0.042. Out of 60 children, 26(43.33%) undergone MRI brain of which in 23(88.46%) of the cases MRI brain was abnormal.
Conclusion: Neonatal hypoglycemia is the most common condition in neonatal critical care units, with a significant morbidity rate during infancy and childhood in the form of developmental delay, epilepsy, vision abnormalities, hearing abnormalities and autism etc. It is

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important to regularly follow these babies for neurodevelopmental assessment to detect and monitor sequalae like developmental delay, epilepsy, visual impairment etc. so as to start early intervention therapy for better neurodevelopmental outcome.

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INTRODUCTION:

Neonatal hypoglycemia is a common clinical metabolic problem, which was reported about 100 years ago. Significant neonatal hypoglycemia was first reported in 1937[1.] Glucose is an essential metabolic fuel for the brain, and in the newborn the proportionately large brain accounts for almost all of total tissue glucose requirements[2.] Thus, low glucose concentrations are likely to result in inadequate brain energy supply. Although the newborn brain can use alternative metabolic substrates, the supply of these is limited. Lactate provides a potential alternative fuel in the first 48 hours and ketones may be available on day 3–4, but each can provide only a small proportion of total brain energy requirements[3]. With the development of science and technology, neonatal hypoglycemia has been widely studied. Data have shown that if the neonatal hypoglycemia is not timely and properly treated, the infants may develop permanent brain injury, namely, neonatal hypoglycaemic encephalopathy[4]. Persistent or recurrent hypoglycemia may lead to long term visual disturbance, hearing impairment, cognitive abnormalities, secondary epilepsy, and other disorders in the central nervous system. The severity of such injuries can exceeds hypoxic-ischemic injury [5.] Energy metabolic disorders during hypoglycemia may lead to brain cell softening, swelling, necrosis, gyrus atrophy or white matter demyelination.[6]. The affected area of neonatal hypoglycaemic brain injury is mainly the cerebral cortex (nerve cells). The fourth lamina of visual cortex is thicker and has more neurons and synapses, thus requiring significantly more blood glucose and also is most susceptible to laminar necrosis[7.]

MATERIAL AND METHODS:

This is a descriptive cross sectional study conducted at the department of pediatrics, Dr. Vitthalrao Vikhe Patil Pravara Rural hospital Loni, Maharastra, India, on children aged 3 months to 12 years coming to Pediatric neurology OPD with documented neonatal hypoglycemia. Study period was between Feb 2022 to Dec 2023. Our study was approved by the Institutional Ethics Committee. *Inclusion criteria* – children coming to pediatric neurology OPD with documented neonatal hypoglycemia, Patients and/or their parents/caretakers willing to give informed written consent. *Exclusion criteria* - Patients with immuno-compromised state e.g.: HIV positive, Perinatal sepsis, Patients with congenital anomalies and conditions, Neonates with meningitis, Neonates with intracerebral bleed. Detailed history with a specific emphasis on risk factors for hypoglycemia was recorded. Thorough clinical examination with special emphasis on the assessment of visual impairment, hearing impairment, developmental assessment and neurological examination was done. Relevant investigations were done wherever appropriate, with special emphasis on EEG and neuroimaging abnormalities like MRI brain. The neonates with postnatal hypoglycemia were observed for delayed milestones and behavioral issues on follow up.

STATISTICAL ANALYSIS:

Data obtained in history, clinical examination and investigation proforma was entered in excel sheet and subjected to appropriate statistical analysis. Data obtained in history, clinical examination and investigation proforma was entered in excel

sheet and analysis using SPSS software for ver. 25.0.

RESULTS:

Out of 60 patients, 31(51.6%) presented with seizures. Global developmental delay was found in children, out of which - gross motor delay in 28 (46.67%), fine motor delay in 29(48.33%), social milestone delay in 18(30%) and language mile stone delay in 18(30%) children. 6 (10%)children had autism spectrum disorders. Vision impairment is seen in 36(60%) cases which have significant p value of 0.042. Out of 60 children, 26(43.33%) undergone MRI brain of which in 23(88.46%) of the cases MRI brain was abnormal with predominantly parieto-occipital lobe gliosis.

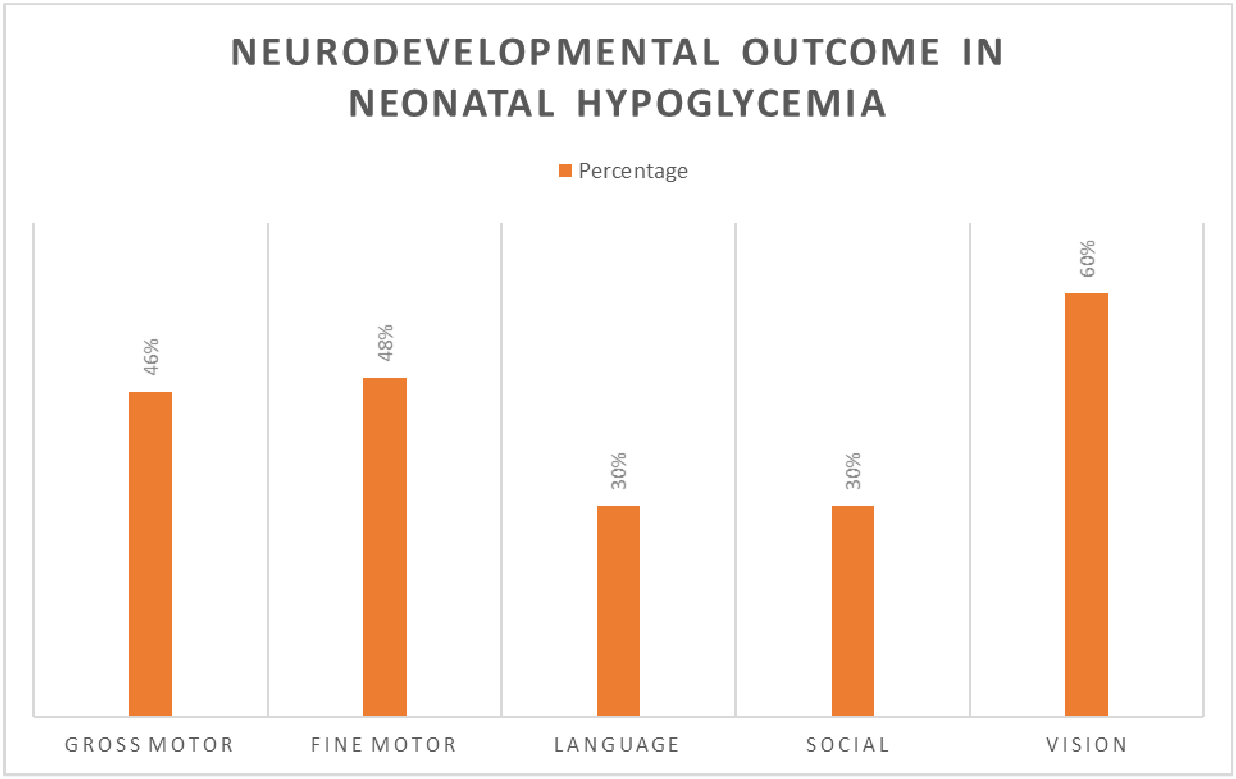

Fig 1: Neurodevelopmental outcomes

DISCUSSION:

In the present study seizures were seen in 51.6% of the study group, however Caraballo RH et al [8] reported 60 % seizures and Yalçın EU, et al[9] reported 85.7% seizures. In the present study gross motor delay is 46% and fine motor delay is 48% and language delay in 30%, whereas in a study done by Taygen Edwards et al[10] language delay was in 23%, motor delay was in 4%. In the present study visual impairment is seen in 60% of the cases, whereas in Alkalay A et al 41% were reported and Caraballo RH et al reported 53.3%. In a study done by Gurkan Gurbuz et al [11] 38(54%) out of 70 cases had abnormal MRI findings, which is similar to the present study that has 23(38%) out of 60 children had abnormal MRI findings, predominantly parieto-occipital lobe gliosis, in another study done by Mei-Hong Gu et al[12], 36(54%) out of 66 had abnormal MRI findings typically involving parietal and occipital lobes.

Conflict of interest: we have no conflict of interest.

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Ethical approval: the study was approved by the institutional ethics committee.

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