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Long-term Outcomes in Pediatric Patients with Newborn Seizures in India: An Indian Perspective

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Introduction :

In infants, seizures represent a significant neurological disorder that may lead to serious long-term consequences. The higher prevalence of newborn seizures in India is largely attributed to common risk factors such as prenatal hypoxia, infections, and metabolic diseases, compared to affluent nations. Newborn seizures, as the most prevalent category of paediatric neurological diseases, require special focus in India, where the healthcare system is still evolving and a significant portion of the population does not have access to specialised neonatal care. This paper explores the causes, treatment options, and long-term impacts of seizures in paediatric patients during the neonatal period, particularly within the context of the Indian healthcare system.

Overview of Newborn Seizures

Newborn seizures, defined as seizures that take place within the first 28 days of life, represent a critical period for brain development. Typically symptomatic and considered a sign of significant neurological dysfunction, these seizures The aetiology and clinical appearance distinguish them from seizures in adults and older children.

Prevalence and Risk Factors in India

Neonatal seizures in India occur more frequently than in affluent countries, highlighting the disparities in prenatal and newborn healthcare. Research conducted in India has demonstrated an incidence ranging from 1.5 to 14 per 1000 live births. The availability of local healthcare resources, prenatal care, and the presence of newborn intensive care units (NICUs) all influence the differences in occurrence.

Typical Reasons in India

In India, seizures in newborns are most frequently caused by:
Hypoxic-Ischemic Encephalopathy (HIE) represents Approximately 40–60% of all newborn seizures documented in India result from perinatal hypoxia. The significant burden of HIE in rural areas is partly due to elevated rates of home births and delayed hospital referrals.
Another primary cause of seizures is neonatal conditions such as meningitis and sepsis. Environments lacking adequate prenatal care, proper sanitation, and immunisation programs will be particularly vulnerable to infections. Key offenders encompass illnesses such as bacterial meningitis, sepsis, and TORCH infections, which include toxoplasmosis, rubella, cytomegalovirus, and herpes simplex virus.
3. Metabolic diseases: Frequent causes of newborn seizures in India encompass hypoglycemia, hypocalcaemia, and electrolyte abnormalities; these conditions are often worsened by delayed or insufficient newborn care. This holds particularly true in rural and resource-limited areas where access to timely and suitable postnatal care is constrained.
A notable aspect is structural brain anomalies, which refer to congenital brain defects. While not as common as HIE or infections, they represent a notable share of seizure causes, especially in situations where prenatal diagnostic programs are limited.
5. Genetic and Epileptic Syndromes: With the increasing accessibility of diagnostic tools, genetic causes of neonatal seizures, such as epilepsy of infancy with migrating focal seizures (EIMFS) and Ohtahara syndrome, are being identified more frequently, although they are reported less often in India than in high-income countries.

Management and Treatment of Acute Conditions in India

Enhancing outcomes relies heavily on the prompt recognition and management of seizures in newborns. In India, particularly in rural areas, various factors hinder the ability to recognise and manage newborn seizures: financial limitations, a shortage of neonatal neurologists, and inadequate neonatal care facilities.

Challenges in Identifying Conditions

Diagnosing neonatal seizures is quite challenging, as infant convulsions typically present as subtle signs, such as unusual eye movements, jerky limb movements, or episodes of apnoea. Ongoing electroencephalogram (EEG) monitoring is the gold standard for identifying newborn seizures in resource-rich environments. In India, access to EEG monitoring is limited, especially in rural and lower-tier healthcare facilities, resulting in diagnoses typically being made based solely on clinical observation.

Therapies for Treatment

In India, the primary treatment for newborn seizures typically includes anti-seizure medications such as phenobarbitone, which remains the most commonly used drug due to its affordability and availability. While they exhibit less desirable adverse effect profiles and long-term neurodevelopmental outcomes, other medications such as phenytoin and benzodiazepines are also utilised.
Hospitals in Indian urban areas are progressively incorporating modern antiepileptic medications such as levetiracetam and topiramate, which are associated with enhanced effectiveness and reduced adverse effects. However, availability and cost can occasionally limit their use.

Challenges in Treatments

In rural India, a significant barrier to effective treatment is the lack of timely medical intervention. Numerous newborns experiencing seizures do not receive adequate medical care during the vital early hours and days of life, often due to home births, inadequate transportation, and postponed hospital referrals.

Long-term Effects of Neonatal Seizures

In addition to an acute neurological crisis, seizures in newborns also suggest potential future neurological and developmental challenges. Various factors influence the long-term outcomes for children who experience seizures in the neonatal period: the root cause of the seizures, the promptness and effectiveness of treatment, and the level of supportive care provided.

Results for Neurodevelopmental Advancement

Cerebral palsy is one condition. Cerebral palsy, particularly common in children who experienced perinatal hypoxia, stands out as one of the most serious long-term consequences of newborn convulsions. Research carried out in India indicates that as many as 40–50% of children experiencing seizures due to HIE develop cerebral palsy.
In survivors of newborn seizures associated with structural brain abnormalities or prolonged treated seizures, cognitive deficits and intellectual disabilities are commonly observed. Children experiencing seizures at birth often face challenges in traditional classroom settings and typically require ongoing educational support.
Numerous newborns who experience seizures face the risk of developing epilepsy later in life. The risk is significantly high when newborn convulsions are triggered by brain abnormalities, metabolic issues, or HIE. Indian research indicates that 10 to 20% of newborns who experience seizures will go on to develop epilepsy, typically within the initial years of life.
Children who survive newborn seizures are also more likely to experience behavioural issues, including autism spectrum disorder and other mood disorders such as attention-deficit/hyperactivity disorder (ADHD). These challenges might not become apparent until the child reaches school age, thereby complicating the long-term treatment of these children significantly.

Death Rates

In India, particularly in rural areas where access to NICUs and specialised treatment is limited, the mortality rates for infants experiencing seizures continue to be elevated. The estimated range of newborn mortality associated with seizures is between 15% and 30%, depending on the underlying cause. Common causes of mortality include serious illnesses such as meningitis and prenatal hypoxia. Delays in therapy or instances where seizures do not respond to first-line medications result in a significantly higher mortality rate.

Challenges and Solutions in Indian Healthcare

Enhancing the long-term outcomes for Indian paediatric patients experiencing newborn seizures requires addressing several key challenges within the healthcare system. While there have been advancements lately, especially in urban areas with access to advanced medical care, further efforts are still required in rural and disadvantaged communities.

Improving Service Accessibility

Improved prenatal care can help avoid many factors such as foetal hypoxia and infections, thereby preventing neonatal seizures. Lowering the occurrence of newborn seizures relies on improving maternal health care, increasing access to prenatal check-ups, and refining the referral system for high-risk pregnancies.

2. Establishing NICUs in Rural Areas: While numerous metropolitan hospitals in India are now equipped with advanced NICUs, rural areas frequently do not have access to these facilities. Enhancing outcomes, particularly for conditions such as HIE that require prompt intervention, relies on expanding newborn intensive care capabilities to distant areas.
3. Providing Resources for Medical Practitioners: Often, insufficient expertise among healthcare professionals leads to the underappreciation or misdiagnosis of newborn seizures. Initiatives aimed at improving early diagnosis and treatment of newborn seizures through training for general practitioners, paediatricians, and midwives could significantly alter the results.

Progress in Technology and Diagnostics

Recent technological advancements are now enhancing the treatment options available for Indian neonates experiencing seizures. While still not widespread, tertiary care hospitals are increasingly utilising video-EEG monitoring to enhance diagnostic accuracy and develop more focused treatment approaches. Moreover, advancements in neuroimaging, such as MRI and CT scans, are aiding in identifying potential structural brain defects that may be responsible for seizures. However, in rural regions—where a significant portion of the Indian population resides—these technologies largely remain inaccessible.

Health Initiatives in the Public Sector

The National Rural Health Mission (NRHM) and the Janani Suraksha Yojana (JSY) program focus on promoting institutional deliveries and providing financial incentives to enhance mother and neonatal health outcomes. These initiatives have been launched by the Indian government as part of various efforts aimed at improving neonatal health outcomes. Incorporating specific strategies to prevent and manage newborn seizures into these programs could significantly enhance long-term outcomes for affected infants.

Support from Parents and Society:

Families of children who have experienced newborn seizures may require ongoing social and psychological support alongside medical care. In areas where access to specialised care and educational support is limited, parents may face significant challenges in caring for a child with developmental delays, cognitive disabilities, or epilepsy.
Early intervention therapies and community-based rehabilitation programs are essential for supporting children who survive newborn seizures in their long-term development. Many regions of India, however, are still in the early stages of development for these types of services, thus further efforts are needed to integrate them into the national healthcare system.
In conclusion, newborn seizures in India represent a significant public health challenge, with extensive implications for the long-term health and development of affected children. While managing the acute seizure episode is of utmost importance, it is crucial to recognise that these seizures often signify underlying neurological issues that may adversely affect the child throughout their life.
Enhancing long-term outcomes for paediatric patients experiencing newborn seizures in India requires a comprehensive approach that encompasses improved access to neonatal care, advancements in prenatal services, investment in healthcare infrastructure, and ongoing support for families. Addressing these challenges will enable India to greatly reduce the incidence of newborn seizures and improve the quality of life for those affected.

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