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# Complex febrile convulsions with early neurodevelopmental impairment in a 6-month-old infant: A pediatric physiotherapy case study

**Dr. Pranali Thakkar**
Assistant Professor, SPB Physiotherapy college, Surat, Gujarat, India

**Abstract**

**Introduction:** Febrile convulsions are the most common seizure disorder in infancy and early childhood, usually associated with fever without evidence of central nervous system infection. Although most febrile seizures are benign, complex febrile convulsions may lead to neurological complications and adverse neurodevelopmental outcomes. Early identification of developmental abnormalities and timely physiotherapy intervention are crucial in improving functional outcomes in high-risk infants.

**Method:** This case report describes a 6-month-old male infant who presented with high-grade fever and recurrent convulsive episodes. Detailed history was obtained from the parents, and comprehensive clinical, neurological, and developmental assessments were performed. Physical examination included evaluation of posture, muscle tone, reflexes, head circumference, motor responses, and developmental milestones. Based on clinical findings, physiotherapy assessment was conducted to identify neuromotor impairments and to plan early intervention strategies.

**Results:** The infant exhibited features of complex febrile convulsions along with abnormal neurological findings, including microcephaly, hypertonia, exaggerated deep tendon reflexes, and delayed motor responses. Postural abnormalities and limited voluntary movements indicated impaired neuromotor development. Early physiotherapy intervention focusing on positioning, sensory stimulation, facilitation of normal movement patterns, and caregiver education was initiated. Gradual improvement in motor responses and tolerance to handling was observed during follow-up.

**Conclusion:** This case highlights that complex febrile convulsions in infancy may be associated with early neurodevelopmental abnormalities. Comprehensive neurological assessment and early physiotherapy intervention play a vital role in optimizing motor development and preventing long-term functional limitations. Early referral and multidisciplinary management are essential for improving outcomes in infants at risk of developmental delay.

**Keywords:** Febrile convulsions, complex febrile seizures, infant, neurodevelopment, physiotherapy intervention, motor delay

## Introduction

Febrile convulsions are the most common seizure disorder in infancy and early childhood, affecting approximately 2–5% of children worldwide. They typically occur between 6 months and 5 years of age and are precipitated by a rapid rise in body temperature, commonly associated with viral or bacterial infections. Although the majority of febrile convulsions are benign, their clinical presentation and long-term implications vary depending on seizure characteristics and associated risk factors. Febrile seizures are broadly classified as simple or complex, with complex febrile convulsions defined by prolonged duration (>15 minutes), recurrence within 24 hours, or focal neurological features [1-3].

The developing infant brain is particularly vulnerable to neurological insults due to ongoing neuronal migration, synaptogenesis, and myelination. Recurrent or prolonged febrile convulsions during this critical period may disrupt normal brain maturation and increase the risk of subsequent neurodevelopmental impairments [4]. Several studies have reported an association between complex febrile convulsions and abnormalities in motor development, muscle tone regulation, and postural control, especially in infants with coexisting perinatal risk factors [5].

Perinatal factors such as delayed birth cry, neonatal seizures, early neonatal intensive care unit (NICU) admission, and hypoxic-ischemic events further increase the susceptibility of infants to neurodevelopmental delays. These factors may compromise central nervous system integrity and predispose infants to early signs of upper motor neuron involvement, including hypertonia, exaggerated reflexes, and abnormal motor patterns [6]. Microcephaly, when present, serves as an important clinical marker of impaired brain growth and is frequently associated with poor neurodevelopmental outcomes [7].

Early identification of motor and postural abnormalities is essential for timely intervention. Physiotherapy plays a critical role in the early assessment and management of high-risk infants by facilitating normal movement patterns, improving postural control, and preventing secondary musculoskeletal complications. Early physiotherapy intervention takes advantage of neuroplasticity during infancy and has been shown to improve motor outcomes and functional independence in children at risk of neurodevelopmental disorders [8-10]. This case study aims to highlight the importance of early physiotherapy assessment and intervention in an infant presenting with complex febrile convulsions and early neurodevelopmental impairment.

## Case Presentation

### Patient Information

- **Age:** 6 months
- **Sex:** Male
- **Informants:** Mother and father

### Chief Complaints

- Not opening eyes for 2–3 days

- Recurrent convulsions
- Reduced spontaneous movements of all four limbs

**History of Present Illness**

The infant was brought with complaints of high-grade fever and recurrent convulsions for approximately 10 days. The fever was not relieved with medications prescribed by a local physician and was associated with cough and excessive crying. Crying episodes were high-pitched and accompanied by intermittent breath-holding. Convulsive episodes were characterized by tightening of all four limbs, upward rolling of eyeballs, and extension of the head, occurring approximately 4–5 times per day. Due to worsening symptoms, the child was admitted to the Pediatric Intensive Care Unit (PICU), where medical management was initiated. Despite stabilization, the child remained irritable and demonstrated reduced eye opening and spontaneous movements.

**Antenatal and Perinatal History**

- Antenatal period was uneventful
- No history of maternal hypertension, diabetes mellitus, or major illness during pregnancy
- Full-term vaginal delivery
- Birth cry delayed; NICU admission for 2 days
- History of neonatal seizures treated with medication
- Initially breastfed, later shifted to oral feeds

**Developmental History**

At 6 months of age, the child was not achieving age-appropriate motor milestones. There was poor head control, reduced antigravity movements, and limited voluntary limb activity. Social interaction and response to auditory stimuli were present but inconsistent.

**Clinical Examination**

**General Examination**

- Eyes partially open, sluggish response to stimuli
- Light reflex present
- No facial asymmetry
- **Chest examination:** equal air entry bilaterally
- **Breathing pattern:** shallow breathing

**Neurological Examination**

- **Posture:** Upper limbs adducted with elbow flexion; lower limbs in flexor posture
- **Tone:** Increased tone in all four limbs (hypertonia)
- **Reflexes:** Exaggerated deep tendon reflexes (knee jerk exaggerated bilaterally)
- **Babinski sign:** Positive bilaterally
- **Motor response:** Reduced spontaneous movements; withdrawal present on painful stimuli

**Anthropometry**

- **Head circumference:** 33 cm (suggestive of microcephaly for age)

**Diagnosis**

Complex febrile convulsions with early neurodevelopmental delay and increased muscle tone

**Physiotherapy Assessment**

**Physiotherapy assessment revealed**

- Poor postural control for age
- Reduced antigravity movements
- Abnormal flexor–extensor synergy patterns
- Poor midline orientation
- Reduced tolerance to handling

**Physiotherapy Intervention**

Physiotherapy was initiated once the child was medically stable.

**Goals**

- Reduce abnormal muscle tone
- Promote normal postural alignment
- Facilitate age-appropriate motor responses
- Prevent secondary musculoskeletal complications
- Educate caregivers for home-based stimulation

**Intervention Protocol**

- Positioning in supine and side-lying to inhibit extensor hypertonicity
- Gentle passive range of motion exercises for all limbs
- Tactile and proprioceptive sensory stimulation
- Facilitation of midline orientation and antigravity movements
- Visual and auditory stimulation to improve alertness
- Parent education regarding handling, positioning, and stimulation techniques

**Outcome**

Short-term outcomes included improved tolerance to handling, mild improvement in spontaneous limb movements, and reduction in irritability. Parents demonstrated appropriate handling and positioning techniques. Long-term neurodevelopmental follow-up was advised.

**Discussion**

The present case highlights the neurodevelopmental consequences of complex febrile convulsions occurring during early infancy and emphasizes the importance of early identification and physiotherapeutic intervention. Febrile convulsions, although often considered benign, may have significant implications when they are recurrent, prolonged, or associated with other neurological and systemic risk factors. In the current case, the infant presented with repeated convulsive episodes, high-grade fever, excessive irritability, and subsequent neurodevelopmental abnormalities, suggesting a complex febrile seizure pattern.

Previous literature suggests that complex febrile seizures are associated with a higher risk of later neurological abnormalities compared to simple febrile seizures [11]. Prolonged seizures can lead to transient or permanent neuronal injury, particularly in vulnerable regions such as the hippocampus and motor cortex. The developing brain, especially during the first year of life, is highly susceptible to excitotoxic injury caused by prolonged seizures and metabolic stress [12]. This vulnerability may explain the abnormal motor tone, exaggerated reflexes, and delayed postural responses observed in this infant.

Microcephaly noted in this case is a critical clinical finding and indicates impaired brain growth. Studies have shown that microcephaly in infancy is strongly associated with adverse neurodevelopmental outcomes, including motor delay, cognitive impairment, and increased risk of cerebral palsy [13]. Reduced head circumference reflects underlying

brain volume loss or failure of normal brain growth, which may result from hypoxic events, infections, or recurrent seizures during early life [14].

The presence of hypertonia, exaggerated deep tendon reflexes, and a positive Babinski sign bilaterally suggests early upper motor neuron involvement. These findings are consistent with previous reports indicating that infants with a history of neonatal or early infantile seizures often exhibit abnormal neuromotor patterns and tone abnormalities during subsequent developmental stages [15]. Abnormal posturing and limited voluntary movement further indicate impaired motor control and delayed maturation of corticospinal pathways.

Early physiotherapy intervention is a cornerstone in the management of infants at high risk for neurodevelopmental delay. Evidence supports that early, goal-directed physiotherapy focusing on postural control, facilitation of normal movement patterns, and sensory-motor integration can significantly improve motor outcomes [16]. Neuroplasticity during infancy allows the central nervous system to reorganize in response to therapeutic input, thereby minimizing long-term functional limitations [17].

In the present case, physiotherapy interventions such as tactile stimulation, positioning, handling techniques, and facilitation of age-appropriate motor skills were initiated to address abnormal tone and delayed motor responses. Studies have demonstrated that early intervention programs initiated within the first year of life are more effective than delayed therapy, particularly in infants with neurological risk factors [18]. Parent education and involvement in home-based stimulation programs further enhance therapy outcomes and promote continuity of care [19].

Overall, this case underscores the need for a multidisciplinary approach in infants with complex febrile convulsions, involving pediatricians, neurologists, and physiotherapists. Early neurological assessment and timely physiotherapy intervention are essential to optimize motor development and improve functional prognosis. Long-term follow-up is crucial to monitor developmental progression and to modify therapeutic strategies as the child grows.

## Conclusion

This case emphasizes the importance of early physiotherapy assessment and intervention in infants with complex febrile convulsions. Multidisciplinary management and caregiver education are essential to optimize neurodevelopmental outcomes.

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