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Community inference of paediatric neurology rehabilitation: Tangible predicament of a hypoxic ischemic encephalopathy

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Abstract

Purpose: This study, grounded in clinical experience and a representative case of cerebral palsy (CP), seeks to advance and refine the approach to paediatric neurology rehabilitation. It highlights the role of a newly established neuropaediatric rehabilitation unit at the University Ayurveda Hospital, Jaipur, which not only delivers patient-centred care but also promotes awareness of neurological disorders and facilitates community-based interventions aimed at improving functional outcomes and reducing caregiver burden.

Method: A two-week pilot study was undertaken across four Local Integrated Health Centres (LIHCs) in Rajasthan. Screening, evaluation, and counselling were conducted by final-year physiotherapy students and medical interns under professional supervision. The study aimed to identify non-tangible risk factors, minimize diagnostic errors, and provide targeted rehabilitative services for children presenting with paediatric neurological disorders.

Results: Three neuropaediatric cases were identified and evaluated during the pilot phase. One child with spastic diplegia cerebral palsy was enrolled for rehabilitation at the neuropaediatric unit. The rehabilitation plan emphasized improving ambulatory ability and reducing caregiver burden through structured home-based interventions.

Conclusion: Community-integrated screening and rehabilitation, delivered through the combined efforts of healthcare professionals and active involvement of family caregivers, can significantly enhance functional outcomes in children with neurological disorders. Such an approach not only supports the child's recovery but also alleviates the broader psychosocial and financial burden on families and the community.

Keywords: Cerebral Palsy, Hypoxic Ischemic Encephalopathy, Local Integrated Health Centres (LIHC), Paediatric Neurology, Paediatric Rehabilitation

Introduction

Neurological disorders in children impose substantial physical, cognitive, emotional, and social challenges, often leading to long-term functional limitations. According to the Centers for Disease Control and Prevention (CDC), families caring for children with special needs frequently experience considerable financial strain and emotional stress due to the chronic nature of these conditions. Neurological rehabilitation, therefore, plays a critical role in improving quality of life by targeting motor deficits, enhancing functional independence, and promoting overall well-being through structured therapeutic interventions.

Cerebral Palsy (CP), one of the most common sequelae of Hypoxic Ischemic Encephalopathy (HIE), is a non-progressive disorder of movement and posture resulting from injury to the developing brain. Its reported prevalence is approximately 3 per 1,000 live births in India, with spastic diplegia being the most frequently observed subtype. Children with CP typically present with developmental delays, impaired motor function, and limitations in performing age-appropriate tasks.

Early detection and timely rehabilitation are critical for mitigating disability, improving long-term outcomes, and reducing caregiver burden. The present study underscores the importance of community-based screening and rehabilitation services as an accessible, cost-effective strategy for addressing neuropaediatric disorders, while also fostering awareness and caregiver participation in the management process.

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Fig 1: Clinical assessment and rehabilitation approach for a child with spastic diplegia cerebral palsy.

Case Presentation

Patient Information

- Name: Jayant, 3 years old male
- First-born child of a non-consanguineous marriage
- Reported birth asphyxia

Clinical Findings

- Diagnosis: Spastic diplegia cerebral palsy
- Presenting complaints: Inability to walk without support, inability to hold objects
- Informant: Grandmother (reliable source)

History

- **Birth history:** Full-term delivery, 2.5 kg birth weight
- **Natal history:** Compromised cerebral blood flow
- **Postnatal history:** Child did not cry immediately, required resuscitation and NICU care for 1 week
- **Developmental history:** Delay in milestones; unable to walk independently by 18 months
- **Family history:** Cousin with motor disability in lower limb
- **Immunization:** Completed (OPV, BCG, DPT, TT)
- Diet history: Normal

Problems Identified

- Inability to bear weight
- Inability to grasp and hold objects
- Dependence on support for walking

Goals

- Motor recovery through reduction of spasticity and stiffness
- Use of neurofacilitation techniques (Bobath, NDT, sensory integration, facilitatory and inhibitory techniques) Enhancing functional independence and caregiver training

Intervention and Methodology

A two-week pilot study was undertaken across four Local Integrated Health Centres (LIHCs) located in Hirnoda, Boraj Dhani, Jharana, and Asalpur, Rajasthan. The screening process included preliminary evaluation, risk factor

identification, and counselling of families. These activities were carried out by final-year physiotherapy students and medical interns (BAMS and BHMS), under the close supervision of faculty members and consultant physicians, ensuring both accuracy and ethical compliance.

Following the screening, one confirmed case of spastic diplegia cerebral palsy (CP) was referred to the University's neuropaediatric rehabilitation unit for comprehensive intervention. The rehabilitation program was designed to address motor limitations, improve functional independence, and support family involvement in long-term care. Interventions comprised the following components:

- **Neurodevelopmental Treatment (NDT):** Focused on promoting normal movement patterns and reducing abnormal postural reflexes.
- **Sensory Integration Therapy:** Applied to enhance sensory processing and motor planning abilities.
- **Task-Specific Training:** Exercises designed to improve ambulation, object handling, and functional daily activities.
- **Home-Based Caregiver Training:** Structured guidance provided to parents and grandparents to ensure continuity of therapy in the home environment and reduce long-term caregiver burden.

This multi-pronged approach emphasized both clinical rehabilitation and community participation, integrating medical supervision with family-driven home management to achieve sustainable out-comes.

Follow-up and Outcomes

Regular follow-up sessions were conducted to monitor the child's progress and evaluate the effectiveness of the intervention program. The outcomes observed included:

- **Improved Ambulatory Ability:** The child demonstrated better mobility with support, indicating positive motor recovery.
- **Reduced Caregiver Burden:** Structured home-based training empowered parents and grandparents to actively participate in rehabilitation, thereby easing physical and emotional strain.
- **Potential for Long-Term Gains:** Early initiation of rehabilitation interventions showed promise for sustained improvements in mobility, functional independence, and overall quality of life.

These outcomes suggest that a combination of clinical rehabilitation and caregiver involvement can significantly enhance both short-term recovery and long-term functional prognosis in children with cerebral palsy.

Discussion

Children with cerebral palsy (CP) frequently require lifelong rehabilitation to address motor impairments, functional limitations, and associated comorbidities. Evidence suggests that early diagnosis combined with structured, multidisciplinary rehabilitation significantly enhances recovery potential, improves quality of life, and reduces the physical and emotional burden on families. The present study supports these findings, demonstrating the value of integrating community-based screening with specialized neuropaediatric rehabilitation services.

The pilot project further highlights the role of trained interns and students, working under professional supervision, in extending the reach of rehabilitation services to underserved

communities. Their involvement not only facilitates early case detection but also strengthens the healthcare delivery system by creating a skilled workforce capable of managing paediatric neurological conditions at the grassroots level. Despite these encouraging results, certain limitations must be acknowledged. The study was restricted by its small sample size and short duration, limiting the generalizability of findings. Additionally, the absence of standardized assessment tools prevented objective measurement of functional outcomes. Future research should aim to incorporate validated outcome measures, larger participant groups, and long-term follow-up to establish stronger evidence for community-integrated rehabilitation models.

Conclusion

Neuropaediatric rehabilitation, particularly for conditions such as cerebral palsy resulting from hypoxic ischemic encephalopathy, requires a comprehensive, multidisciplinary and community-integrated approach. Coordinated medical, motor, educational, psychological, and social interventions not only improve functional outcomes in affected children but also alleviate the broader psychosocial and financial burden on families and communities. Early, structured intervention combined with caregiver involvement is key to maximizing recovery potential. Future research should prioritize larger cohorts, standardized outcome measures, and long-term follow-up to strengthen evidence for sustainable community-based rehabilitation models.

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