Rehabilitation for Preterm Infants in Low- and Middle-Income Countries: A Mini-Review

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Abstract

Preterm birth is a major global health challenge, affecting approximately 15 million infants each year, with more than 60% born in low- and middle-income countries (LMICs). Advances in neonatal care have improved survival; however, limited access to early rehabilitation services contributes to persistent neurodevelopmental, motor, and cognitive impairments among preterm children. There is evidence that rehabilitation interventions, including physiotherapy, occupational therapy, speech and language therapy, and early developmental support, can play an important role in promoting optimal developmental outcomes. Despite this evidence, implementation strategies relevant to LMIC contexts are inconsistent and fragmented.

This mini review aims to summarize current evidence on rehabilitation and early intervention strategies for preterm infants in LMICs. It identifies key barriers to early rehabilitation; and suggests practical strategies to improve access to and continuity of rehabilitation care.

The review highlights knowledge gaps and identify opportunities to integrate early rehabilitation within neonatal and child health programmes in LMICs.

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Introduction

Preterm births are a major and ongoing challenge for global child health, accounting for approximately 15 million births annually. Nearly 60% of preterm births occur in low- and middle-income countries (LMICs).[1] Improvements in perinatal and neonatal care in the last 2 decades have increased survival rates.[2] However, a growing number of preterm infants experience long-term neurodevelopmental impairments, including difficulties in motor performance, cognition, behaviour, and learning.[3]

In LMICs, these developmental challenges are frequently compounded by gaps in post-discharge follow-up, limited availability of rehabilitation services, and inadequate systems for early developmental surveillance.[4] Evidence from literature suggests that early developmental intervention programmes for preterm infants, particularly those initiated during infancy or soon after hospital discharge, can improve cognitive outcomes, with more variable and context-dependent effects on motor development.[5]

Rehabilitation interventions delivered during infancy, including physiotherapy, occupational therapy, and structured developmental support, have the potential to positively influence developmental trajectories.[6] However, the availability, quality, and continuity of these interventions vary widely across LMICs, and guidance on effective implementation remains limited. This mini-review provides an overview of rehabilitation and early intervention approaches for preterm infants in LMICs. It also discusses key barriers to effective implementation and explores strategies to strengthen integration of rehabilitation within child health systems.

Rehabilitation and Early Intervention for Pre-term Infants

There are a number of rehabilitation interventions that can improve the functional outcomes in preterm infants, when they are offered early and coordinated assistance.

Physical Therapy

Physical therapy is a core component of early intervention for children with premature birth having developmental delays. Existing literature suggests that early physiotherapy interventions are more effective when they are developmentally appropriate, individualized, and delivered with adequate intensity. Structured approaches that emphasize postural control, movement variability, and caregiver involvement may support improvements in Paediatric rehabilitation approaches such as Neurodevelopmental Treatment therapy at an early age have improved gross motor function by 15-20% compared to traditional methods.[7]

In LMIC contexts, physiotherapy also plays an important role in supporting attainment of age-appropriate milestones and preventing secondary complications, such as contractures and maladaptive movement patterns.

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Interventions that integrate therapeutic activities into daily caregiving routines may be particularly relevant in areas where access to frequent facility-based therapy is limited.

It is important to mention that while some studies report improvements in gross motor outcomes following early intervention, the magnitude and consistency of effects vary, particularly across different settings.

Occupational Therapy

Preterm infants are commonly exposed to atypical sensory environments during prolonged neonatal intensive care unit stays. This may contribute to sensory processing difficulties, including hypo- or hyper-responsivity. Occupational therapy interventions focus on supporting sensory processing strategies such as tactile input, vestibular processing regulation, postural control, and joint position sense.[8] Early occupational therapy can address sensory modulation, feeding skills, early play, and caregiver–infant interaction. All of these are foundational skills for later motor and functional development. Early identification of sensory processing challenges is important, as these difficulties can influence motor development.[9] In addition, occupational therapy contributes to the development of feeding skills, early play, and functional participation, which are essential for later independence in daily activities. In LMIC settings, occupational therapy interventions that emphasize caregiver education and low-cost, home-based strategies may enhance feasibility and sustainability.

Speech and Language Therapy

Speech and language pathologists (SLP) play an important role in supporting communication, feeding, and early social development in preterm infants, who are at increased risk for language delay, feeding difficulties, and later communication disorders.[10] Early speech and language therapy interventions focus on foundational communication skills such as eye contact, joint attention, vocalization, and turn-taking, which are critical for subsequent expressive and receptive language development.

SLPs also address early oral-motor control and sensory regulation, which support both feeding competence and the development coordination and sensory regulation to support safe and efficient feeding. Family-centered approaches, including parent coaching and responsive communication strategies embedded in daily routines, are particularly relevant in resource-limited settings. Such approaches promote continuity of intervention beyond clinical settings and support early social interaction between caregivers and infants.[11]

Barriers to Rehabilitation for Preterm Infants

Despite the evidence for early rehabilitation intervention in preterm infants, many barriers limit the optimal delivery of these services. Some of these barriers are as follows:

Limited Access to Specialized Rehabilitation Professionals

Many LMICs face a shortage of paediatric Rehabilitation Medicine physicians, physiotherapists, occupational therapists, and speech and language therapists, particularly those trained in neonatal and early intervention care. Rehabilitation services are often available only in tertiary care referrals hospitals, limiting access for families living in rural or underserved areas. As a result, preterm infants may experience delayed initiation of rehabilitation or receive no services during early developmental periods.

Financial Constraints

The costs associated with rehabilitation services and transportation can be a substantial barrier for many families. In LMIC such as Pakistan, rehabilitation services for preterm infants may be available only in large public hospitals but often require repeated costly visits to tertiary centers, leading to significant transportation cost and time allocation. Private rehabilitation services are typically unaffordable for most families. This combination of indirect costs in the public sector and high fees in the private sector restricts timely initiation and sustained access to rehabilitation for preterm infants.

Caregiver Health Literacy and Household Demands

Many caregivers have limited awareness of the long-term developmental risks associated with prematurity. This can reduce engagement with rehabilitation services and adherence to home-based interventions that are important in resource-constrained settings. In LMICs, parents, particularly mothers often manage multiple responsibilities at the same time, including household tasks and care of other children, often without any support. These competing demands limit the time and consistency required for participation in rehabilitation programmes or home-based therapeutic activities. Rehabilitation for preterm infants is a long-term process that requires sustained commitment and active caregiver participation. Over time, many parents experience stress, competing demands, and emotional or financial strain, which may lead to reduced motivation and premature discontinuation of therapy.

Strategies to Overcome Barriers to Rehabilitation in LMICs

Strengthening the Rehabilitation Workforce

Workforce shortages can be addressed through task-shifting and capacity-building strategies, including training

community health workers and rehabilitation assistants to deliver basic developmentally supportive interventions under professional supervision. Integrating rehabilitation services into primary healthcare and district-level facilities can reduce dependence on tertiary centers and improve access for families in remote or underserved areas.

Reducing Financial and Transportation Barriers

Community-based and home-based rehabilitation models can reduce travel-related costs and reduce the need for frequent hospital visits. Integrating early rehabilitation into existing maternal and child health programmes, along with transportation subsidies or travel vouchers, may further improve access to service. Tele-rehabilitation and remote follow-up models offer additional opportunities to support continuity of care, particularly where specialist services are scarce.

Enhancing Caregiver Education and Engagement

Caregiver-related barriers can be reduced through structured education and coaching programmes that can improve understanding of the long-term developmental risks associated with prematurity and clarify the goals and expectations of rehabilitation. Clear guidance on the time commitment required for home-based activities and practical strategies for integrating therapy into daily routines may improve adherence. The use of culturally appropriate instructional materials, including simple written instructions and short demonstration videos, can further support caregivers in correctly performing exercises and developmental activities at home. Video-based guidance allows parents to revisit instructions as needed, reduces reliance on repeated in-person visits.

Improving Caregiver Motivation and Adherence

Ongoing follow-up and supportive communication with caregivers are required to maintain motivation and adherence to therapy. Discussing realistic therapeutic goals, expected timelines, and challenges encountered during home-based intervention can help caregivers remain engaged in the rehabilitation process. It is important to identify and address caregiver concerns, including burn out and to provide timely support . This may reduce dropouts from rehabilitation programmes.

Conclusion

Preterm infants in LMIC , including Pakistan, face a high risk of adverse neurodevelopmental outcomes due to limited access to early rehabilitation services. Early rehabilitation interventions, including physiotherapy, occupational therapy, and speech and language therapy, can support motor, sensory, feeding, and communication development; however, access and continuity of care remain inconsistent. Barriers include workforce shortages, financial constraints, and caregiver burden. This limits sustained engagement with rehabilitation services. Integrating low-cost, home-based, and tele-rehabilitation approaches within existing maternal and child health systems may improve access, continuity, and long-term developmental outcomes for preterm infants in resource-limited settings.

Conflict of Interest: None

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