

Ayurvedic Management of Cerebral Palsy in Children: Current Evidence and Future Perspectives

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Abstract—Cerebral palsy (CP) is the most common cause of childhood physical disability, characterized by permanent disorders of movement and posture resulting from non-progressive injury to the developing brain. It is frequently associated with sensory, cognitive, behavioral, communication, and musculoskeletal impairments, significantly affecting the quality of life of affected children and their families. Although conventional management, including physiotherapy, occupational therapy, speech therapy, and pharmacological interventions, helps improve functional outcomes, it often provides limited long-term benefits and does not address the condition holistically. Ayurveda offers a comprehensive and individualized approach to the management of cerebral palsy by emphasizing correction of Vata Dosha, enhancement of neuromuscular function, and improvement of overall growth and development. Therapeutic modalities such as Abhyanga, Swedana, Shashtika Shali Pinda Sweda, Basti, Nasya, and selected Medhya Rasayana formulations have been traditionally employed to improve muscle tone, motor function, coordination, speech, cognition, and quality of life. Emerging clinical studies suggest that integrating Ayurvedic interventions with conventional rehabilitation may enhance functional recovery, reduce spasticity, and improve daily living activities with a favorable safety profile. However, the current evidence is constrained by small sample sizes, heterogeneous treatment protocols, inadequate methodological quality, and limited long-term follow-up. This review critically summarizes the available evidence on Ayurvedic management of cerebral palsy in children, discusses the probable mechanisms of action from both Ayurvedic and modern scientific perspectives, identifies existing research gaps, and highlights future directions. Well-designed randomized controlled trials, standardized treatment protocols, objective outcome measures, and multidisciplinary collaborative research are essential to establish robust

evidence for the integration of Ayurveda into comprehensive cerebral palsy care.

Index Terms—Cerebral palsy, Ayurveda, Vata Vyadhi, Panchakarma, Abhyanga, Basti, Shashtika Shali Pinda Sweda, Medhya Rasayana, Pediatric rehabilitation, Integrative medicine.

I. INTRODUCTION

Cerebral palsy (CP) is one of the most common causes of chronic motor disability in children, resulting from a non-progressive disturbance in the developing fetal or infant brain. Although the primary brain injury does not worsen over time, the associated musculoskeletal complications, functional limitations, and secondary disabilities may progress with growth if not managed appropriately. The global prevalence of cerebral palsy is estimated to be approximately 2–3 cases per 1,000 live births, making it a major contributor to childhood disability and long-term healthcare burden.¹² Advances in neonatal care have improved survival among premature and low-birth-weight infants, yet the prevalence of cerebral palsy remains relatively stable because of increased survival of high-risk neonates.³ Children with cerebral palsy commonly present with delayed developmental milestones, abnormal muscle tone, impaired posture, spasticity, involuntary movements, poor balance, and difficulties in gait and coordination. Depending on the severity and type of brain injury, many children also experience epilepsy, intellectual disability, speech and language impairment, visual and hearing deficits, feeding difficulties, sleep disturbances, and behavioral disorders. These associated impairments significantly affect functional independence, educational

attainment, and psychosocial well-being while placing considerable emotional and financial stress on caregivers.⁴⁻⁶

Modern management of cerebral palsy is primarily supportive and multidisciplinary, involving physiotherapy, occupational therapy, speech therapy, orthopedic interventions, pharmacological agents such as antispastic medications, botulinum toxin injections, and surgical procedures in selected cases. Although these interventions improve mobility and reduce complications, they are largely directed toward symptomatic management and rehabilitation rather than restoration of neurological function. Long-term therapy is often required, and functional outcomes vary depending on the severity of neurological impairment.⁷⁻⁹

Ayurveda, the traditional system of medicine of India, adopts a holistic approach by addressing the underlying imbalance of Dosha, Dhātu, Agni, and Srotas. Although cerebral palsy is not described as a separate disease entity in the classical Ayurvedic texts, its clinical manifestations closely resemble various Vata Vyadhi, particularly conditions associated with impaired neuromuscular development and motor dysfunction. The predominance of Vata Dosha, especially Vyana Vata, Prana Vata, and Udana Vata, is considered responsible for abnormalities in movement, muscle tone, speech, coordination, and cognitive functions. The involvement of Majja Dhātu, Snayu, Mamsa Dhātu, and Manovaha Srotas further contributes to the clinical manifestations observed in affected children.¹⁰⁻¹²

The Ayurvedic management of cerebral palsy aims not merely to alleviate symptoms but to improve overall physical, neurological, and psychological development. Therapeutic interventions including Abhyanga, Swedana, Shashtika Shali Pinda Sweda, Basti, Nasya, and Medhya Rasayana are widely practiced to reduce muscle stiffness, improve joint mobility, enhance muscle strength, support neurodevelopment, and improve functional independence. These therapies are generally combined with physiotherapy and developmental rehabilitation to achieve better clinical outcomes.¹³⁻¹⁵

In recent years, increasing attention has been directed toward integrative medicine, where Ayurveda is employed alongside conventional rehabilitation. Several clinical studies have reported improvements in Gross Motor Function Measure (GMFM) scores,

muscle tone, activities of daily living, speech, and quality of life following comprehensive Ayurvedic interventions. However, the available evidence is still limited by small sample sizes, heterogeneous treatment protocols, and methodological shortcomings, necessitating more robust scientific investigations.¹⁶⁻¹⁸

The present review aims to summarize the current evidence regarding the Ayurvedic management of cerebral palsy in children, correlate modern concepts with Ayurvedic principles, evaluate commonly employed therapeutic interventions, discuss available clinical evidence, and highlight future directions for research to facilitate evidence-based integration of Ayurveda into pediatric neurorehabilitation.

Modern Overview of Cerebral Palsy

Cerebral palsy comprises a heterogeneous group of permanent disorders affecting movement and posture due to non-progressive disturbances in the developing fetal or infant brain. The neurological insult may occur during the prenatal, perinatal, or early postnatal period and primarily affects motor control, although multiple associated neurological impairments are frequently present.¹⁹

Etiology

The etiology of cerebral palsy is multifactorial and includes several prenatal, perinatal, and postnatal risk factors.

Prenatal factors include:

- Maternal infections
- Placental insufficiency
- Genetic abnormalities
- Intrauterine growth restriction
- Congenital brain malformations
- Multiple pregnancies

Perinatal factors include:

- Birth asphyxia
- Prematurity
- Low birth weight
- Intraventricular hemorrhage
- Neonatal hypoxic-ischemic encephalopathy

Postnatal factors include:

- Meningitis
- Encephalitis
- Severe neonatal jaundice
- Head trauma
- Stroke

- Central nervous system infections²⁰

Clinical Types

According to the predominant motor abnormality, cerebral palsy is classified into:

- Spastic cerebral palsy (approximately 70–80%) – characterized by hypertonia, exaggerated tendon reflexes, and muscle stiffness.
- Dyskinetic cerebral palsy – characterized by dystonia, chorea, and athetosis due to basal ganglia involvement.
- Ataxic cerebral palsy – characterized by impaired balance, coordination, intention tremor, and gait abnormalities.
- Mixed cerebral palsy – combination of two or more motor patterns.²¹

Clinical Manifestations

The clinical presentation varies according to the severity and site of brain injury. Common manifestations include:

- Delayed developmental milestones
- Abnormal muscle tone
- Persistent primitive reflexes
- Spasticity or involuntary movements
- Poor postural control
- Gait abnormalities
- Muscle contractures
- Joint deformities
- Speech and swallowing difficulties
- Intellectual disability
- Seizures
- Visual and hearing impairment
- Feeding difficulties²²

Ayurvedic Perspective of Cerebral Palsy

Ayurvedic classics do not describe cerebral palsy as an independent disease entity; however, its clinical features can be understood under the broad spectrum of Vata Vyadhi, particularly disorders involving impairment of motor function, muscle strength, speech, and neurological development. Since Vata Dosha governs all voluntary and involuntary movements, neuromuscular coordination, sensory perception, and higher neurological functions, any disturbance in its normal physiology can result in manifestations resembling cerebral palsy.¹⁰

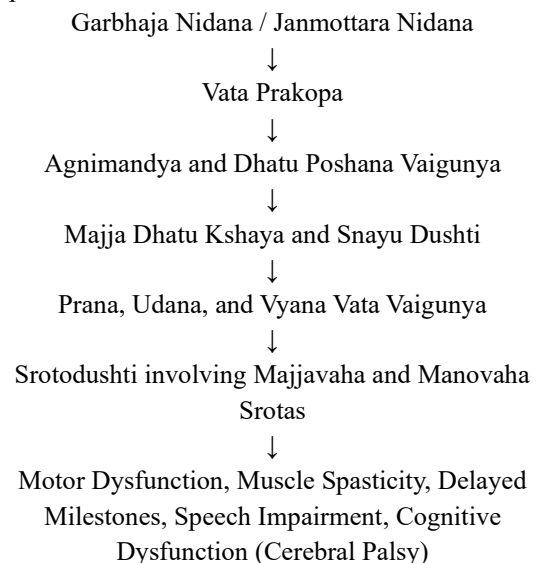
From an Ayurvedic perspective, congenital neurological disorders may arise due to Beeja Dushti,

Garbhopaghataka Bhava, improper maternal diet and lifestyle during pregnancy (Garbhini Aparicharya), nutritional deficiencies, intrauterine insults, difficult labor, birth trauma, or neonatal complications. These factors disturb the normal development of the fetus and lead to derangement of Vata Dosha, particularly affecting Majja Dhatu, Snayu, Mamsa Dhatu, and Manovaha Srotas.¹¹

The predominant involvement of Prana Vata, Udana Vata, and Vyana Vata explains the characteristic manifestations observed in cerebral palsy. Prana Vata regulates higher neurological functions and cognition, Udana Vata governs speech and voluntary activities, whereas Vyana Vata controls coordinated body movements, muscle function, and locomotion. Their derangement results in delayed motor development, abnormal muscle tone, impaired coordination, speech abnormalities, and functional disability.¹²

Ayurvedic Samprapti

The probable Ayurvedic pathogenesis can be explained as follows:



This understanding forms the basis for Ayurvedic therapeutic interventions aimed at Vata Shamana, Brimhana, Balya, Rasayana, and restoration of neuromuscular function.

Ayurvedic Principles of Management

The management of cerebral palsy in Ayurveda is primarily based on the principles of Vata Shamana, Brimhana (nourishment), Balya (strength-promoting therapy), Rasayana (rejuvenation), and restoration of

normal neuromuscular function. Since cerebral palsy resembles a chronic Vata Vyadhi, treatment is individualized according to the age of the child, severity of motor impairment, associated disabilities, and overall strength (Bala) of the patient. The primary objective is to improve muscle tone, enhance motor development, reduce spasticity, promote cognitive functions, and maximize functional independence rather than merely treating symptoms.¹⁹⁻²¹

Ayurvedic management is usually multimodal and combines Shodhana, Shamana, external therapies, internal medications, dietary regulation, physiotherapy, speech therapy, and psychological support. Early intervention is considered particularly beneficial because of the greater neuroplasticity observed during childhood.²²

Panchakarma in Cerebral Palsy

Panchakarma therapies constitute an integral component of Ayurvedic management for neurological disorders. These procedures are believed to pacify aggravated Vata Dosha, nourish weakened tissues, improve circulation, enhance neuromuscular coordination, and facilitate functional recovery.²³

Abhyanga

Abhyanga (therapeutic oil massage) is one of the most frequently employed treatments in children with cerebral palsy. Medicated oils such as Bala Taila, Mahanarayana Taila, Ksheerabala Taila, and Dhanwantaram Taila are commonly used according to the patient's condition.

Regular Abhyanga helps to:

- Reduce muscle stiffness and spasticity
- Improve peripheral circulation
- Enhance flexibility and joint mobility
- Promote muscle nourishment
- Improve sleep and relaxation
- Facilitate motor learning when combined with physiotherapy²⁴

The gentle tactile stimulation produced during massage may also positively influence sensory integration and neuromuscular coordination.

Swedana

Following Abhyanga, Swedana is generally administered to relieve muscle tightness and improve joint mobility. Mild sudation reduces Stambha

(rigidity), Gaurava (heaviness), and facilitates better movement.

Among various methods, Nadi Sweda and Bashpa Sweda are frequently employed in selected children after proper assessment.²⁵

Shashtika Shali Pinda Sweda (SSPS)

Shashtika Shali Pinda Sweda, also known as Navarakizhi, is considered one of the most effective nourishing therapies for pediatric neuromuscular disorders.

The procedure involves bolus fomentation using cooked Shashtika Shali rice processed with herbal decoction and milk. It provides simultaneous oleation, sudation, and nourishment.

Reported therapeutic benefits include:

- Improvement in muscle strength
- Better joint flexibility
- Reduction in muscle stiffness
- Enhancement of gross motor function
- Improvement in nutritional status
- Better endurance during rehabilitation²⁶

Several clinical studies have reported significant improvements in Gross Motor Function Measure (GMFM) scores following SSPS administered along with physiotherapy.

Basti Therapy

Among all Panchakarma procedures, Basti is regarded as the principal treatment for Vata disorders because the colon is considered the primary seat of Vata Dosha. Classical Ayurvedic texts describe Basti as "Ardha Chikitsa" or even "Poorna Chikitsa" for Vata Vyadhi.²⁷ In pediatric practice, carefully selected Matra Basti or Yapana Basti is commonly preferred under expert supervision.

Potential therapeutic actions include:

- Pacification of aggravated Vata
- Nourishment of tissues
- Improvement in muscle tone
- Better bowel habits
- Reduction in contractures
- Improvement in mobility and functional activities²⁸

Modern hypotheses also suggest that rectal administration of lipid-based formulations may influence the gut-brain axis, autonomic nervous system, and inflammatory pathways, although these mechanisms require further scientific validation.

Nasya Karma

Nasya involves the administration of medicated oils through the nasal route. Ayurveda considers the nose as the gateway to the head ("Nasa Hi Shiraso Dwaram"). Therefore, Nasya is traditionally indicated in disorders affecting the brain and higher neurological functions.²⁹

Medicated oils such as Ksheerabala Taila, Anu Taila, and Brahmi Ghrita are commonly utilized depending on clinical indications.

Reported benefits include:

- Improvement in concentration
- Better speech development
- Enhanced cognitive functions
- Reduction in muscle rigidity
- Improved sleep quality

Although encouraging clinical observations are available, large-scale controlled studies are still lacking.

Internal Ayurvedic Medications

Internal medications are selected according to the child's constitution, digestive capacity, associated symptoms, and severity of neurological impairment. Most formulations possess Balya, Brimhana, Medhya, and Rasayana properties.³⁰

Commonly prescribed formulations include:

- Brahmi Ghrita
- Kalyanaka Ghrita
- Panchagavya Ghrita
- Ashwagandha Churna
- Bala Churna
- Guduchi
- Shankhapushpi
- Yashtimadhu
- Mandukaparni
- Saraswatarishta
- Ashwagandharishta
- Balarishta³¹

These medicines are believed to improve cognitive performance, muscle strength, memory, immunity, and overall physical development while supporting long-term neurological rehabilitation.

Diet and Rehabilitation

Ayurveda emphasizes the importance of appropriate nutrition (Pathya Ahara) for children with chronic neurological disorders. Easily digestible, nourishing, and Vata-pacifying foods prepared with milk, ghee,

green gram, rice, wheat, seasonal fruits, and vegetables are generally recommended. Adequate protein intake is essential to support muscle development and growth.³²

Equally important are non-pharmacological interventions such as:

- Physiotherapy
- Occupational therapy
- Speech therapy
- Sensory integration therapy
- Stretching exercises
- Orthotic support
- Psychological counselling
- Parent education

An integrative rehabilitation program combining Ayurvedic therapies with conventional rehabilitation has shown encouraging clinical outcomes in several studies.

Current Clinical Evidence

During the last two decades, increasing research has explored the effectiveness of Ayurvedic interventions in children with cerebral palsy. Most published studies have evaluated combinations of external therapies, Panchakarma procedures, internal medications, and physiotherapy rather than single interventions.³³

Several prospective clinical studies have demonstrated improvements in Gross Motor Function Measure (GMFM) scores, reduction in muscle spasticity assessed by the Modified Ashworth Scale (MAS), better sitting balance, enhanced walking ability, and improved activities of daily living following comprehensive Ayurvedic treatment.³⁴

Shashtika Shali Pinda Sweda, when administered along with Abhyanga and physiotherapy, has consistently shown beneficial effects on muscle flexibility, joint mobility, and motor performance. Similarly, children receiving Matra Basti or Yapana Basti have demonstrated improvements in muscle tone, gait pattern, and bowel function, suggesting a favorable role of Basti in chronic Vata disorders.³⁵

Studies evaluating Medhya Rasayana formulations, including Brahmi Ghrita, Ashwagandha, Guduchi, and Mandukaparni, have reported positive effects on cognition, attention span, speech development, and behavioral outcomes. However, these findings are based predominantly on small observational studies and pilot clinical trials.³⁶

Despite these encouraging observations, the existing evidence has several limitations. Most studies include relatively small sample sizes, lack adequate randomization, employ heterogeneous treatment protocols, and have short follow-up durations. In addition, standardized outcome measures, assessor blinding, and multicentric trials are often absent, making it difficult to draw definitive conclusions regarding efficacy.³⁷

Nevertheless, the available literature indicates that Ayurveda may serve as a valuable complementary approach when integrated with conventional rehabilitation. The holistic combination of Panchakarma, internal medications, nutritional support, and rehabilitative therapies appears to improve overall functional outcomes and quality of life without significant adverse effects when administered under qualified supervision.³⁸

II. DISCUSSION

Cerebral palsy is a lifelong neurodevelopmental disorder that significantly affects motor function, posture, cognition, communication, and overall quality of life. Although the primary neurological injury is non-progressive, secondary complications such as muscle contractures, skeletal deformities, nutritional deficiencies, and functional limitations often increase with age. Therefore, successful management requires a comprehensive and multidisciplinary approach aimed at improving functional independence and minimizing disability. Conventional treatment primarily focuses on rehabilitation through physiotherapy, occupational therapy, speech therapy, pharmacological management of spasticity, and orthopedic interventions. While these modalities are effective in improving specific functional outcomes, they often provide symptomatic relief and require prolonged rehabilitation.

Ayurveda offers a holistic perspective by considering cerebral palsy under the spectrum of Vata Vyadhi, where aggravated Vata Dosha, particularly Prana Vata, Udana Vata, and Vyana Vata, plays a central role in the pathogenesis. Disturbances in Majja Dhatu, Snayu, and Manovaha Srotas are believed to contribute to impaired neuromuscular coordination, delayed motor development, speech abnormalities, and cognitive dysfunction. This understanding provides the basis for individualized treatment aimed at correcting the

underlying doshic imbalance while promoting tissue nourishment, neurological recovery, and overall growth.

The multimodal Ayurvedic treatment approach integrates Abhyanga, Swedana, Shashtika Shali Pinda Sweda, Basti, Nasya, internal medications, dietary regulation, and rehabilitation therapies. These interventions collectively aim to reduce muscle stiffness, improve joint mobility, strengthen muscles, enhance circulation, promote tissue nourishment, and improve neurological functions. In addition to their physical benefits, these therapies may also improve sleep quality, digestion, appetite, and psychological well-being, thereby contributing to better overall health.

Clinical studies conducted over recent years have reported encouraging improvements in motor function, muscle tone, balance, gait, cognitive performance, speech, and activities of daily living following integrated Ayurvedic management. External therapies such as Abhyanga and Shashtika Shali Pinda Sweda have demonstrated positive effects on muscle flexibility and functional mobility, while Basti therapy has shown promise in reducing spasticity and improving neuromuscular coordination. Similarly, Medhya Rasayana formulations have been associated with improvements in attention, memory, learning ability, and behavioral outcomes. These findings suggest that Ayurvedic interventions may complement conventional rehabilitation and enhance overall therapeutic outcomes.

Despite these promising observations, the available scientific evidence remains limited. Many published studies involve small sample sizes, lack adequate randomization and blinding, use heterogeneous treatment protocols, and have relatively short follow-up periods. Differences in patient selection, disease severity, intervention duration, and outcome assessment further limit the generalizability of findings. Consequently, although existing evidence supports the potential benefits of Ayurveda, stronger clinical evidence is required before definitive recommendations can be established.

Future research should focus on developing standardized treatment protocols based on classical Ayurvedic principles while incorporating validated neurological assessment tools. Large multicentric randomized controlled trials with longer follow-up periods are essential to evaluate the efficacy, safety,

and long-term sustainability of Ayurvedic interventions. Advanced neuroimaging techniques, neurophysiological assessments, biomarkers of neuroplasticity, and quality-of-life measures may further help elucidate the mechanisms through which Ayurvedic therapies exert their therapeutic effects. Collaborative research involving pediatric neurologists, rehabilitation specialists, physiotherapists, and Ayurvedic physicians will strengthen the evidence base for integrative management.

Overall, Ayurveda appears to offer a safe, holistic, and patient-centered approach that addresses multiple dimensions of cerebral palsy beyond motor disability alone. When integrated with modern rehabilitation, it has the potential to improve functional capacity, enhance quality of life, and reduce caregiver burden. However, evidence-based practice supported by high-quality scientific research remains essential for wider acceptance and incorporation into routine pediatric neurorehabilitation.

III. CONCLUSION

Cerebral palsy remains one of the leading causes of long-term physical disability in children, requiring continuous multidisciplinary rehabilitation and supportive care. Although conventional treatment effectively improves functional abilities and reduces complications, it does not completely address the complex physical, neurological, and psychosocial challenges associated with the disorder. Ayurveda provides a comprehensive management strategy by emphasizing Vata Shamana, tissue nourishment, rejuvenation, and restoration of neuromuscular function through Panchakarma procedures, internal medications, dietary regulation, and rehabilitative measures.

Current clinical evidence suggests that integrating Ayurvedic interventions with conventional therapies may improve motor performance, muscle tone, cognition, speech, and overall quality of life in children with cerebral palsy. Nevertheless, the existing literature is limited by methodological shortcomings and insufficient high-quality clinical trials. Future well-designed, multicentric randomized controlled studies with standardized treatment protocols and objective outcome measures are necessary to establish robust scientific evidence. An evidence-based

integrative approach combining Ayurveda with contemporary rehabilitation may provide a promising and holistic model for improving long-term outcomes and enhancing the overall well-being of children living with cerebral palsy.

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