



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

UNRAVELING THE AYURVEDIC PREVENTIVE PARADIGM IN CEREBRAL PALSY

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Received 15th Nov. 2023; Revised 19th Dec. 2023; Accepted 8th June 2024; Available online 1st April 2025

<https://doi.org/10.31032/IJBPAS/2025/14.4.8897>

ABSTRACT

Cerebral palsy is a complex neuro developmental disorder that affects movement, posture and muscle coordination, leading to lifelong disabilities. Despite significant advances in medical research, the etiology of cerebral palsy remains multifactorial and largely elusive. In recent years, there has been growing interest in exploring complementary and alternative medicine approaches, such as Ayurveda, to address the prevention and management of cerebral palsy.

This paper aims to investigate the Ayurvedic preventive paradigm for cerebral palsy by reviewing relevant literature and empirical evidence. Ayurveda, a traditional system of medicine originating from ancient India, is based on a holistic approach that considers the individual's physical, mental and spiritual well-being. The Ayurvedic perspective on cerebral

palsy posits that imbalance in the three doshas- vata, pitta, and kapha- are fundamental in its pathogenesis.

The study critically evaluates Ayurvedic preventive measures that encompass age of the couple, preconception care, prenatal care and postnatal interventions. Preconception care emphasizes parental health and well-being, emphasizing the importance of balanced diet, lifestyle modifications and detoxification to ensure healthy progeny. Prenatal care involves nurturing the expectant mother with specific dietary regimens, herbs and therapies to promote proper fetal development and prevent complications.

Furthermore, the paper delves into postnatal interventions aimed at providing comprehensive care to the newborn. Ayurvedic therapies, including abhyanga (oil massage), swedhana (sudation), and specific herbal formulations, are used to support neurodevelopmental milestones and enhance neuromuscular functions. Additionally, dietary recommendations incorporating herbs and nutritional supplements, play a significant role in bolstering the child's physical and cognitive development.

Integrating Ayurvedic principles with conventional medical approaches may offer a holistic and personalized approach to mitigate the risk of cerebral palsy and potentially improve the quality of life for affected individuals. However, further collaborative research efforts are necessary to validate and integrate Ayurveda into mainstream healthcare practices for cerebral palsy prevention.

Keywords: cerebral palsy, Ayurvedic measures, prevention, Ayurvedic classics, Healthy progeny

INTRODUCTION:

Cerebral palsy is a common neurodevelopmental condition which begins in early childhood and persists throughout the lifespan. Abnormal motor control and tone in the absence of an underlying progressive disease is the clinical hallmark of cerebral palsy.

In 1862, William James Little, an orthopaedic surgeon, provided the first description of “spastic rigidity” related to prematurity and birth complications, referring to the condition as Little’s disease.

William Osler later introduced the term “cerebral palsy” in 1888. Subsequently, Sigmund Freud observed that antepartum and postpartum factors might be causally related to cerebral palsy [1].

Population-based studies from around the world report prevalence estimates of cerebral palsy ranging from 1 to nearly 4 per 1,000 live births or per 1,000 children. The prevalence of cerebral palsy is higher for children born preterm or at low birthweight. Most (82.9%) of the children

identified with cerebral palsy had spastic cerebral palsy [2]. There are several types of cerebral palsy, classified by the kind of movement affected, the body parts affected, and the symptoms. The five main types of cerebral palsy are spastic, hypotonic, athetoid, ataxic and mixed with spastic form being the most common.

The definition of cerebral palsy describes a group of disorders of the development of movement and posture, causing activity limitation that is attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behaviour, and/or by a seizure disorder [3]. Despite the reduction in the rate of birth asphyxia from 40/100 000 in 1979 to 11/100 000 in 1996, no associated reduction in the prevalence or incidence of cerebral palsy was seen [4].

Cerebral palsy is highly associated with prematurity and suboptimal birth weight. This could be due to maternal comorbidities, intrauterine or extrauterine insults. The mainstay of reducing the incidence of this disease should be aimed at addressing those causes and their risk factors. There are a vast number of these factors and they all share a common thing; they are potentially preventable.

These risk factors include maternal age (low or advanced), nulliparity or multiparity, maternal disease like diabetes, hypertension, preeclampsia, eclampsia, placental abruption, and intrauterine infections. There are also risk factors that are associated post-delivery and they are acute hypoxic events stemming from cardiovascular or respiratory diseases, strokes, seizures, prolonged ventilation, sepsis, metabolic or endocrine disorders and inborn errors of metabolism [5].

Cerebral palsy is a significant health concern affecting millions of children worldwide, with considerable impacts on the quality of life for affected individuals and their families. As modern medicine continues to explore various therapeutic interventions. The ancient healing system of Ayurveda presents a unique approach to preventive healthcare by offering valuable insights into its holistic principles and potential contributions to the prevention of this complex neurodevelopmental disorder.

The foundation of Ayurveda lies in its understanding of the interconnectedness of the human body with nature including the Panchamahabhutas (five elements), Tridoshas (Vata, Pitta and Kapha) and the concept of Agni (digestive fire). These fundamental concepts form the basis for Ayurveda's preventive approach to health and disease.

MATERIALS AND METHODS:

Source of data – data collected from the Ayurvedic classics like Caraka Samhita, Susrutha Samhita and Kashyapa Samhita related to prevention of diseases in connection with cerebral palsy causative factors. These classics are the foundation and record enriched with human experience. Also collection of information available from indexed journal articles and genuine web sources.

PREVENTIVE MEASURES:

PRIMARY PREVENTION - preventing the occurrence of cerebral palsy.

This comprises the following measures.

1. **Atulya gotra vivaha** (Non-Consanguineous marriages):

For procreation of a healthy child caraka in sharira sthana has said that the couple should be of a different lineage [6]. The benefits of refraining from such unions is reduction in genetic risk for the disorders which get inherited by recessive genes, potentially leading to congenital malformations and syndromes. Having consanguineous parents increased the risk of cerebral palsy almost 3-fold [7]. Offering genetic counselling and testing for families with a history of genetic disorders associated with cerebral palsy, such as leukodystrophies and metabolic disorders can prevent cerebral palsy.

2. **Kala (age of couple for conception):**

Paternal age effect was detected in those with athetoid/ dystonic cerebral palsy and congenital hemiplegia. These observations

indicate that some cases of athetoid/dystonic or hemiplegic cerebral palsy might arise by fresh dominant genetic mutation [8].

Avoiding early and late marriages will help in preventing preterm births. As the research states that preterm birth is accepted as a main risk factor for cerebral palsy, reflected in the fact that over 40% of individuals with CP are born preterm [9]. Encephalopathy of prematurity is a leading risk factor for developing CP from 20–60% of individuals who eventually develop CP. This condition is a complicated amalgam of various disturbances involving both gray and white matter injuries in different brain regions caused by intrauterine systemic infection and / or hypoxia–ischemia.

White and gray matter lesions are the most prevalent type of injury observable in the magnetic resonance images of children with CP, with a correlation of quantitative damage of gray and white matter lesions with the severity of motor and cognitive deficits in children with CP [10]. White matter injury, or so-called, periventricular malacia, is a well-established prognostic factor for CP development. Severe brain lesions might be related to excitotoxicity microglial activation, reactive gliosis, the express of free radicals, as well as subsequent hypomyelination that can be detected by ultrasound and MRI.

On the other hand, the prevalence of Encephalopathy of prematurity is dismissed,

and is could be seen in only 5% of survivors with very-low-birthweight; nonetheless, diffuse periventricular malacia is currently the most frequent type of lesion observed in 90% of very-low-birthweight survivors who eventually develop CP [11].

3. Pre conceptional purificatory methods (shodhana): A couple desiring good progeny should first undergo purification therapies [12]. The combination of healthy sperm and ovum results in healthy progeny. In embryogenesis each procreative factor contributed in the physical and mental growth and development of certain structures as well as functions of the body which may lead to foetal origins of adult disease. To prevent the genetical origin of cerebral palsy the couple has to follow the purificatory regimen prior to plan of pregnancy [13]. Also to prevent the congenital cerebral and non cerebral anomalies of cerebral palsy [11].

4. Fulfilling the dauhrida desires to prevent congenital malformations:

When senses of the fetus get manifested, its mind gets associated with feelings and due to this the fetus starts shuddering and expresses the wishes termed as *dauhrida* (bi-cardiac condition) [14]. Deficiency in any of these nutritive compounds in the fetus may be reflected as the desires in the mother. Meat intake is also included under this cravings which are rich in vitamins such as vitamin B12, thiamine,

riboflavin, pyridoxine, zinc, iron etc. All these are required for the proper growth of the fetus. Brain malformations, which can be caused by genetic defects, can lead to cerebral palsy. A study investigated the relation between folate intake during pregnancy and the risk of cerebral palsy in children [15].

5. Following garbhini paricharya to impart nutrition to the foetus:

Caraka acharya mentioned monthly regimen to be adopted in a steadily developing, normal pregnancy [16]. This regimen serves the nutritional demand for the growing fetus. Among which the intake of ghee has a relation with cerebral palsy. DHA (docosahexaenoic acid) which appears to be essential in neural development, while DHA deficiency has been implicated in periventricular haemorrhage and cerebral palsy [17]. DHA content was significantly higher in ghee prepared by traditional method using curd starter fermentation. The findings suggested that *ghrita* prepared by traditional ayurvedic methods contains higher amount of DHA; Omega-3 long-chain polyunsaturated fatty acids, which is a major component of retinal and brain tissues and remains important in prevention of various diseases [18].

6. Avoiding medication during first trimester:

This prevents teratogenicity mentioned by Kashyapa in Kashyapa Samhita [19].

Several lines of evidence support the theory that multiple genetic factors contribute to the cause of cerebral palsy. First, mutations in multiple genes result in mendelian disorders that present with cerebral palsy-like features, and several single-gene mutations have been identified in idiopathic (ie, non-syndromic) cerebral palsy pedigrees. Second, the prevalence of congenital anomalies in individuals with cerebral palsy (11–32%) is significantly higher than in the general population (2–3%).

Most malformations in children with cerebral palsy are cerebral (72%), of which microcephaly (26%) and hydrocephaly (19%) are the most common. Among the non-cerebral malformations, the most frequent are cardiac (29%), musculoskeletal (14%), and urinary abnormalities (9%), and facial clefts (18%). Third, register-based studies have reported a significantly higher concordance rate for cerebral palsy in monozygotic twins than in dizygotic twin pairs ($p=0.0026$). Fourth, the risk of cerebral palsy in consanguineous families is about 2.5 times higher than the risk in outbred families. Fifth, several studies have reported familial aggregation of cerebral palsy, including identical cerebral palsy syndromes in the same family [20].

SECONDARY PREVENTION - Halting and arresting disease progression by early diagnosis and treatment.

This includes the following:

1. Navajata shishuparicharya, especially pranapratyagamana and umbilical cord cutting were said by acharya caraka to prevent birth asphyxia condition which remains as the cause in majority of the cases. Certain measures should also be performed on the newly born child, such as gently striking the stones near the root of the ear, and sprinkling of cold or hot water over its face, to rejuvenate its vital breath that might have stopped due to distress. If the child is not moving or does not revive, it should then be fanned with a winnowing basket made of bamboo etc till it regains consciousness (the procedures to be continued till consciousness is established) [12]. A meta analysis study suggests that birth asphyxia is associated with an increased risk of cerebral palsy [21]. Hence following the navajata shishuparicharya would help in preventing the cerebral palsy.
2. Birth injuries: Studies discuss the prevalence, severity rates, and types of brain lesions in children born preterm between 2004 and 2010. it provides valuable insights into the relationship between birth injuries and cerebral palsy(10). Hence measures should be taken to prevent birth injuries.

3. Emphasizing Raksha karma in prevention of infections to avoid septicemia. In a large study of more than 6000 premature infants (401 to 1000 g at birth), infants with sepsis alone (without meningitis) had 50% to 100% higher rates of cognitive deficits, cerebral palsy, and other neurodevelopmental disabilities compared with uninfected infants [22].

Tertiary prevention - to prevent complications and maximization of functions by disability limitations and rehabilitation.

This level includes the process of following:

1. Abhyanga which stimulates the formation of para neurons in compensating the neuronal activity. Sudation therapy to improve tonicity of the muscle. Skin is considered as the main abode of *Vata* along with *Pakvashaya*.

As *Abhyanga* and *Shashtikashali Pinda Sveda* involve cutaneous manipulation, it is considered as one of the prime procedures for mitigating *Vata*. These modalities of external therapy may act by dermal mechanisms of drug absorption and action. Primarily it acts by two mechanisms *viz.*, local and central.

The local mechanisms include cutaneous stimulation

causing the arterioles to dilate and thereby achieving more circulation. It also assists venous and lymphatic drains. This state of hyper circulation also enhances the transdermal drug absorption and assimilation. Massage causes movement of the muscles thereby accelerating the blood supply, which in turn helps in relieving the muscular fatigue and reduces stiffness. Skin is an organ with rich sensory nerve endings, which on stimulation gives abundant sensory inputs to the cortical and other centers in CNS. This fact was exploited since thousands of years for stimulation of higher centers of central nervous system, which is evident when it is referred that *Snehana* and *Svedana* are the prime mode of treatment in treating neurological conditions [23].

2. Medhya rasayanas (nootropic drugs) and concept of swarnaprashana in addressing the cognitive functions mentioned in lehanadhyaya of Kashyapa Samhita to encounter the cognitive dysfunction. They help in increasing circulation to the brain, varying the concentration of neurotransmitters, reducing brain inflammation, activating the formation of new brain cells and

defending the brain from free-radical damage.

Swarna prashan is a metallic medicinal preparation widely used in *Ayurveda* pediatrics. The main ingredients are swarna prashan (gold nanoparticle), gou ghrita (cow ghee), madhu (honey), and other medhya dravyas (drugs which enhance intellectual, memory). According to the Indian classical text, has been proposed as a potent medicine for immunotherapies and vaccine development due to its indefinite size, shapes, charges, and surface functionality [24]. The Swarnabhasma has been scientifically proved for free-radical scavenging activity and in immunological disorders [25].

3. And various shodhana and shamana drugs which helps in preventing the child from acquiring early disability and make the child ambulated. understanding the microanatomy of the gut. It reveals scattered, frequently solitary hormone producing cells of the stomach, intestine and pancreas. These are known as Gastro entero pancreatic (GEP) endocrine system able to produce peptides and amines as active as hormones or as neurotransmitter.

Gastro entero pancreatic system releases their secretions in response to nutrient stimulation from the circulation and

lumen and has the potential to secrete into the circulation and lumen too. These specialised cells of gut are known as entero endocrine cells, enterochromaffin cells etc. as they exactly act like that of neurons of the brain, they are designated as paraneurons. The GEP endocrine cells are presumed to have receptor sites on their surface, adequate stimulation to which by “Secretogogous” triggers stimulus reaction. When Vasti dravyas are passed through the GIT tract probably stimulate the cells and act as Secretogogous thus compensating neurological deficit and improving the functions [26]. Ayurvedic interventions at an early age will increase the quality of life.

DISCUSSION:

Cerebral palsy is a neurologic motor disorder that can be attributed to several underlying mechanisms during intrauterine life or throughout the newborn period. Ayurveda considers it as a Shiromarmabhighataja Vatavyadhi, which means a neurological disorder caused by injury to the vital points in the head. Ayurveda believes that cerebral palsy is mainly due to the imbalance of Vata dosha, which is responsible for the functions of movement, sensation and cognition. Vata dosha can be aggravated by various factors such as genetic defects, maternal infections, fetal hypoxia, birth trauma, environmental toxins, etc.

Ayurveda offers a holistic approach to prevent and manage by addressing the root cause of the disease and restoring the balance of doshas. Also emphasizes on the importance of prenatal and postnatal care to prevent cerebral palsy. Ayurveda advises pregnant women to follow a healthy diet, lifestyle and mental state to ensure the proper development of the fetus. Ayurveda also recommends various herbs, oils and massages to prevent complications during pregnancy and delivery.

After birth, Ayurveda suggests special care for the newborn such as Swedana (sudation therapies), Snehana (oleation therapies), Sodhana (purification therapies), internal medication including Brmhana (strengthening therapies), Rasayana (rejuvenating therapies), Medhya (brain-enhancing therapies) and Swarna Prashana (gold drops) to enhance the growth and development of the baby. Ayurvedic treatment aims to improve the motor skills, cognitive functions, speech, digestion, immunity and overall well-being of the patients with cerebral palsy.

The prevention requires a comprehensive approach that encompasses prenatal, perinatal and postnatal factors. collaborative efforts among healthcare providers, researches and policymakers are essential to implement and evaluate these preventive measures. Ayurvedic classics have highlighted the significance of preventive

measures which carry its scientific validity in any era.

The integration of Ayurvedic principles with modern medical practices holds promises for enhancing preventive strategies against cerebral palsy. By recognizing the importance of preconception care, maternal health, and postnatal practices Ayurveda provides valuable insights that can positively impact public health initiatives and improve the quality of those at risk. Ayurveda can be a valuable adjunct to conventional medicine in the prevention and management of cerebral palsy which can offer a natural, safe and effective way to improve the quality of life of the patients with cerebral palsy and their caregivers.

CONCLUSION:

On the basis of classics, it is evident that the attempt to shed light on preventive aspects ended up delegitimizing various concepts of Ayurvedic preventive strategies. Research has to be carried out to establish the efficacy and applicability of these preventive paradigms into evidence-based guidelines. Collaboration between Ayurvedic principles and modern medical researchers could create a synergistic effect, yielding to the development of integrated preventive programs for cerebral palsy. Ultimately, the treatment of cerebral palsy must be preventive before it occurs. Although cerebral palsy is a complex and

multidimensional condition, a better outcome measure to characterize the whole child with cerebral palsy is needed. However, more research is needed to validate the efficacy and safety of Ayurvedic interventions for CP.

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