THINK INDIA JOURNAL

ISSN:0971-1260

Vol-22-Issue-10-November-2019

"Respone Of Poly Herbal Formulation Of Ayurveda In Developmental Milestones Delay Of Children Due To Cerebral Palsy (Cp)"

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THINK INDIA JOURNAL

ISSN:0971-1260

Vol-22-Issue-10-November-2019

ABSTRACT:

Background and Aim:

Developmental delay is condition where a child does not gain specific milestones at the expected age Impairments caused by CP include visual impairment, hearing impairment, epilepsy, motor weakness, mental retardation, emotional disturbance, distinctive types of learning disabilities. Many poly-herbal formulation of *Ayurveda* are effective in delay milestone due to cerebral palsy up to some extent. Main aim of this article is to elaborate about developmental milestones delay due to cerebral palsy and its treatment by different poly herbal formulation of *Ayurveda*.

Methodology

This review work was carried out by using a wide-ranging and organized data mining approach. To achieve significant literature author uses the key words "delay milestone in CP" and "cognition impairment in Cerebral palsy," "poly herbal formulation for delay milestone due to cerebral palsy" was parallel searched in different index journals.

Result:-

Seven research publications were included in the final selection after systematic analysis.

Conclusion: -

Developmental delay is common problem and affecting 1- 3% of the child population. Vacha mula (*Acorus calamus*), is mainly use in subsiding neurological symptoms of brain. *Samvardhana Ghrita* is very effective for the treatment of *Pangu* (Lame), *Muka* (Dumb), *Ashruti* (Deaf) and *Jada* (Mental deficient / Idiot) child. *Brahmi Ghrita* strengthening memory and cognition impairment of CP children. *Ashtamangala Ghrita* enhance memory, cognitive function and regeneration of nerve as well as it protect from the infection. *Ayushman-8* is very effective in *Manasika-mandata* (mental retardation) of children.

ISSN:0971-1260

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Key words: -. Developmental delay, Cerebral Palsy, Vacha mula, Samvardhana Ghrita Ayushman-8.

Introduction:

Development includes the qualitative and quantitative a change of childhood period.[1] Development is closely related to central nervous system (CNS) maturity and proceeds in cephalo-caudal direction (head to foot) e.g. head control develops early followed by grasp ability ,sitting, crawling, standing, walking etc. and gross to specific i.e. central to periphery. Developmental delay is also knows as Delayed milestone in childhood period. Delay in getting language, hearing, thinking, and motor skills milestones is called developmental delay.[2] Milestones are often measured using percentiles, and for many milestones a value between the 5th and 95th percentile does not require interference, though values towards the edges of that range can be associated with other medical conditions.[3] Developmental delay is common problem and affecting 1- 3% of the child population.[4] Delays in one domain may affect skills in another area also. Many neuro-developmental disorders of children shows global developmental delay as a main feature such as Cerebral palsy (CP) etc. Cerebral palsy (CP) is a common problem, the worldwide, incidence being 2 to 2.5% per 1000 live births.[5] It is the leading cause of chronic disability in children[2] making them physically and mentally handicapped and socially aloof. About 25 lakhs children are suffering from CP[6], and is the commonest cause of motor impairment in childhood and associated with life-long disability.[7] The etiology of CP is very diverse and multi-factorial; include congenital, genetic, inflammatory, infections, anoxic, traumatic and metabolic. The injury to the developing brain occurs during prenatal, natal and postnatal period.[8] Overall 75-80% cases are due to prenatal injury with less than 10% being due to significant birth trauma or asphyxia.[9] The most important associated risk factor with CP seems prematurity and low birth weight.[10] An estimated 60%-100% of patients with cystic periventricular leukomalacia (PVL) go on to develop CP.[11-12] Delay in getting language/speech, hearing, cognition and motor skills milestones is common in cerebral palsy patients.

According to world health organization (WHO) up to 80% of the population depends on traditional medicine for their primary health care. In *Ayurveda* the term *Samskara* is described which affect the psycho-socio-emotional development of the term and preterm

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neonates during their development stages. *Ayurveda* has accepted these *Samskara* to assess the growth and development of the infant, inoculation of good qualities by giving the exposure to different types of qualitative and quantitative stimuli for achieving social, psychological, physical and intellectual effects. In *Ayurveda, Phakka roga* is explained by *Acharya Kashyap* which is related to delayed developmental milestone. *Ayurveda* explains some other conditions such as *Pangulya* (locomotor disorders), *Mukatva* (Speech or language disorder), *Jadatva* (inability to do motor activities) which explain delay in developmental milestones. *Phakka roga* is a clinical manifestation with continuous deterioration of growth associated with delayed motor developmental milestones. *Phakka roga* suggesting delayed developmental milestones of locomotor system and immaturity of the pyramidal tracts or central nervous system. Child continues to cripple even after completion of one year of age. Normally, a child develop milestone of walking at 12 month (one year) of age. [13] Many polyherbal formulation are described in *Ayurveda* for the treatment of delayed developmental milestones in children due to cerebral palsy (CP) such as *Samvardhana ghrita Ashtamangal Ghrita, Brahmi ghrita* and roots of Vacha (*Acorus calamus*) etc.

Aim: - This review article provides the detail about developmental delay in children due to cerebral palsy (CP) and its treatment by poly herbal formulation of *Ayurveda.*

Developmental delay (DD):

Developmental delay is an umbrella term used when children are significantly cognitive and physical development delayed. Developmental delay in childhood period can be due to many etiological factors like genetic, syndrome, metabolic, Duchenne Muscular Dystrophy, endocrine, infections (neonatal meningitis) and cerebral palsy etc.[15] Developmental Delay has two major divisions-[14]

1. Global developmental delay – Delay in two or more than two domains (multiple domains).
2. Specific developmental delay: Delay in single domain such as Motor or Speech & Language.

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Developmental delay is a descriptive word where a cause is not yet established and difficulties are apparent earlier in childhood. The diagnosis of developmental delay is limited to children younger than 5 years old and confirm by proper history and examination. [16]

Cerebral palsy (CP):

The most important associated risk factor with CP seems prematurity and low birth weight.[17] Cerebral palsy (CP) increases to 8-40% in high-risk population such as in extremely preterm infants.[18] Cerebral refers to the cerebrum a major portion of human brain, which is the affected area of the brain in this disease [19], and Palsy means paralysis which refers to weakness / lack of muscle control.[20] According to the WHO, estimation of CP in India is 3.8% of population associated with some form of disability.[21] Specific risk factors of Cerebral Palsy related to of the neuronal insult in particular time period i.e. Prenatal, Perinatal and Postnatal period are enlisted in the table.[22]

Table no-1: Risk factors for Cerebral palsy (CP)

Prenatal	**Perinatal**	**Post natal**
Genetic (Chromosomal anomaly) Congenital (Brain-malformation) Maternal factors: Iron deficiency and diseases. Teratogens: (Drugs and Radiation. Infections: TORCH. Premature separation of placenta Prolonged labour.	Birth-Asphyxia Prematurity Intraventricular – hemorrhage (IVH) Sepsis and meningitis Hypoglycemia Hyperbilirubinemia	Kernicterus Intraventricular-haemorrhage (IVH) CNS infections. Seizures Hypoxic damage Head trauma Symptomatic hypoglycemia.

Genetic factors contribute in about 2 percent cases. Birth asphyxia was earlier considered as an important cause of CP, however it accounts for about 10 percent of cases of CP.[23]

Development delay (DD) due to Cerebral palsy (CP):

About35 to 62% CP children have the association of epilepsy, and its incidence increases in spastic quadriplegia (50 to 94%) than hemiplegic, diplegic or ataxic CP. 28% visual impairments and ocular motility like strabismus, amblyopia, nystagmus, optic atrophy and refractive errors, are found in CP children.[24]

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Hearing impairments also occurs in ~12% of children suffering with CP, while the speech and language disorders like articulation disorders and impaired speech are present in 38% children suffering from the CP.[25] An estimated 60%-100% of patients with cystic peri-ventricular leukomalacia (PVL) go on to develop CP.[26] The incidence of dysarthria is estimated to range from 31 to 88%. [27]

Table 1: Speech, hearing and vision disorders in case of Cerebral Palsy: [28]

Eyes	Nearly half of the patients have strabismus, paralysis of gaze, cataract, coloboma, retro-lental fibroplasias, perceptual and refractive errors
Ears	Partial or complete hearing loss is usual in kernicterus. Brain damage due to rubella may be followed by receptive auditory aphasia.
Speech	Aphasia, dysarthria and dyslexia are common among dyskinetic individuals.

In cerebral palsy, many developmental milestones is affected such as [29] –

- Speech/language milestones
- Hearing milestones
- Gross or fine motor milestones
- Cognition impairment

Speech/language milestone:

Speech and language is the most useful and most widely used form of communication. Language typically develops in a very predictable fashion, and assessment of language development should be a central part of every well-child visit. The children who have communication problems may develop behavior problems and difficulty to read and write later in life.[30] Children with language problems in preschool are at risk of poor educational achievement in school age and are at increased risk to develop emotional and behavioral disorders. Speech is affected in CP due to bilateral corticobalbar and neuroromotor dysfunction.[31]

Speech or language impairment means a communication disorder, such as stuttering, impaired articulation, language impairment, or a voice impairment, that adversely affects a child's educational performance.[32] Disorders of speech and language affect up to 8% of preschool children. Boys are nearly twice as likely to have an identified speech or language

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impairment as girls. Speech and language problems can survive together or separately.[33] Mental retardation is one of the common causes of speech delay and associated with more than 50% of cases. [34]

Hearing milestone:

Hearing is one of the five senses, along with vision, taste, smell, and touch. There are two types of sensory cells within the cochlea: inner and outer hair cells. The inner hair cells generate the electrical signals that are sent to the brain, while the outer hair cells act as amplifiers, increasing the stimulus delivered to the inner hair cells.[35] It is important to note that a fixed number of these cochlea sensory cells are present at birth: in humans and other mammalian species, these sensory cells do not regenerate once they have been damaged.[36]

Gross or fine motor milestone:-

Gross motor delay is most common symptoms of Cerebral palsy in which child is not rolling, crawling and walking, at the right age. Gross motor activities involve major part of body such as arms, legs, and torso (middle of the body). Fine motor activities are small movements like holding small objects. Children with cerebral palsy can have a delay in gross motor skills, fine motor skills, or both. Gross and fine motor function and associated neurological impairments in children with cerebral palsy (CP) can be graded by Gross Motor Function Classification System (GMFCS). [3]

Cognition impairment:

Cerebral palsy (CP) is due to immature brain damage before, during, or after birth and its outcome in both motor and cognitive impairment.[38] About 30 to 50 percent of children with Cerebral Palsy have some level of cognitive impairment. Some of the most common signs for cognition impairment in cerebral palsy children is short attention span, difficult to focus on subject, difficult in learning, difficult in language development and difficult in speaking development etc. Cognitive impairment in Cerebral palsy (CP), affect the performance of functional activities and incorporation with community and school surroundings.[39]

Assessment of Developmental milestones:

There is no systematic description of developmental milestones in *Ayurveda*. But they have been indirectly described in form of some *Sanskars*, some of which can be considered close to the milestones described in modern texts such as showing of sun and moon to child during

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first month[40]; taking the time child out of '*Sutikagara*' in 4th month [41-42], indicating development of vision and motor coordination. Child was allowed to play with non toxic and heaven (Trauma less) toys etc. and sit from sixth month.[43] An indirect time was estimated for milestone of standing, in description of *Phakka roga Chikitsha*.[44]

In modern sciences, clinical tools that measure physical and cognitive functions include the Gross Motor Function Measure (GMFM), the Bayley Infant Development Screening test-II (BSID-II). One of the first tests was devised by the pioneering pediatrician and child psychologist Arnold L. Gesell (1880-1961). He observed infants and young children, filmed them analyzed their functioning frame-by-frame, and learned the normal stages in early human behavioral development. Gessell development evaluates gross motor, fine motor, social, adaptive and language behavior.[45]

Methodology

This review work was carried out by using a wide-ranging and organized data mining approach. To achieve significant literature author uses the key words "delay milestone in CP" and "cognition impairment in Cerebral palsy," "polyherbal formulation for delay milestone due to cerebral palsy" was parallel searched in Google Scholar, web of science, Science direct, Scopus, Medline and PubMed Central journal literature.

Result:-

Every substance what is find on the earth has its medicinal value in one or another way as quoted in *Ayurveda*. Each will work by its potency for particular action either as a result of its pharmacodynamics and chemical constituents or an inconceivable action of end product (i.e. *Prabhava*-an unexplainable property). In case of compound drug the final result is the outcome of combination power of content drug. Seven research publications were included in the final selection after systematic analysis.

Poly herbal formulation for Developmental delay:

Main reason behind developmental delay of cerebral palsy patients is damaged neurons. Many poly-herbal formulation of *Ayurveda* are effective in delay milestone due to cerebral palsy up to some extent-

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Vacha mula:-

Vacha mula (*Acorus calamus*), is mainly use in loss of consciousness, confusion of the mind and epilepsy and as a traditional *Ayurvedic* medicine to treat memory loss. Phenolic compounds present in the plants have ability of scavenging free radical which shows antioxidant activity.[46] Many studies claimed that the roots of Vacha (*Acorus Calamus*) helps in subsiding neurological symptoms of brain [47, 48, 49] has positive effects on memory disorder.[50] Root of *Vacha* is very effective to improve grasping power, speech (language milestones) [51] and learning performance, by declining brain lipid peroxide content.[52] *Vacha* is very effective for cerebral ischemia and clearing speech to the children.[53-54]

Use of *Ayurvedic* medicine with honey enhances the potency and decreases its bitterness so increase its palatability.[55] Root of *Acorus calamus* is traditionally employed in nervous disorder. It has got prominent action on central nervous system where it improves grasping power, memory, intellect and speech. Vachamula (*Acorus calamus*) uses in cerebral palsy patients, after rubbing 30-50 times on the stone with milk along with wet half to one almond after rubbing on the same stones as per the recommendation with honey as *Anupana*.

1. Samvardhana ghrita:-

Samvardhana Ghrita is described by *Acharya Kashyapa* in *Lehadhyaya*. It is mentioned for the rapid growth of healthy child and treatment of *Pangu* (Lame), *Muka* (Dumb), *Ashruti* (Deaf) and *Jada* (Mental deficient / Idiot) child. This *Ghrita* is prepare by the method of *Sneha Kalpana Vidhi*.[56] Main Ingredients of *Samvardhana ghrita* are Khadira (*Acasia catechu)*, Prishniparni (*Uraria picta)*, Bala (*Sida cordifolia)* , Atibala (*Abutilon indicum)* , Saindhav (Sodium Chloride) and Kshira (Milk) etc. Over all property of *Samvardhana ghrita* is opposite to the properties of *Vata* such as it having *Kashaya*, *Madhura* and *Lavana rasa* and *Madhura vipaka*. Hence *Samvardhana Ghrita* helps in improving these parameters and symptoms of cerebral palsy. [57] *Samvardhana Ghrita* has better response on speech or language mile stones in cerebral palsy, especially in patients of age <5 years.[58]

2. Brahmi ghrita:-

Brahmi Ghrita is a polyherbal Ayurvedic formulation that is indicated for *Unmada* (pshycosis) and *Apasmara* (epilepsy) and *Vishama jvara* (malaria). *Brahmi* (*Bacopa monnieri*) is one of the main ingredients of *Brahmi Ghrita* and it has nootropic action. Other ingredients is *Trikatu* (Sonth-*Zingiberofficinale*), Pippali-*Piper longum*, Maricha-*Piper*

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nigrum), Trivrut (*Operculina terpenthum*), Shankhapushpi (*Convolvulus pluricaulis*), Sapthala (*Ophiorrhiza mungos*) and Vidanga (Embelia ribes) etc. Active alkaloids of *Brahmi* such is Bacoside A and B which is responsible for improving memory related functions, attributed to the ability to enhance the efficiency of transmission of nerve impulses, there by strengthening memory and cognition.[59-60] In *Ayurveda*, mainly cow ghrita is used which alleviates *Pitta* and *Vata*. Cow ghrita is beneficial for *Swara prasadanam* (improves voice) and *Varna prasadanam* (improves complexion).[61-62]

3. Ashtamangala Ghrita:-

Ashtamangala Ghrita is described by *Yogaratnakara* which has been used as a *Medhya, Smriti vardhaka* and *Rakshoghna* (Enhance memory & cognitive function as well as it protect from the infection). Ashtamangal Ghrita contains eight ingredients –Bramhi (*Bacopa monneri*), Vacha (*Acorus calamus*), Pippali (*Piper longum*), Sariva (*Hemidesmus indicus*), Kushtha (*Saussurea lappa*), Siddarthaka (*Brassica campestris*), *Saindhava* (Rock salt) and *Ghrita*. [63] *Ashtamangala Ghrita* enhance memory, cognitive function and regeneration of nerve as well as it protect from the infection. Lipophilic action of *ghrita f*acilitates transportation to a target organ because cell membrane also contains lipid. This lipophilic nature of *ghrita* facilitates entry of the formulation into the cellular level.[64]

4. Ayushman-8:

Ayushman-8 is poly-herbal formulation developed by Central Council for Research in Ayurvedic Sciences (CCRAS), Ministry of AYUSH which containing *Shankhpushpi* (*Convolvulus pleuricaulis* Chois), *Brahmi* (*Bacopa monniera*) and *Vacha* (*Acorus calamus*) reported to be effective on *Manasika-mandata* (mental retardation).[65]*Shankhpushpi* calms the nerves by managing the production of the stress hormones, adrenaline and cortisol level in body.[66] Brahmi (*Bacopa monniera)* is a well-known nootropic drug and reported for its cognitive enhancer and memory enhancer property.[67] Rhizome and root of Vacha has been used to cure diseases especially the central nervous system (CNS) abnormalities.[68]

Summary:-

Developmental delay due to cerebral palsy (CP) is a common problem in pediatric practice. Developmental delay in vision, hearing, Speech & Language etc. are common in cerebral palsy due to damage neurons. There is no effective treatment formulated till date for

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developmental delay due to brain damage CP patients. *Ayurvedic* treatment can definitely help to reduce disability and improve the functioning of the affected person to a great extent as they can structural reformation of damaged neurons and stimulation for better functional recovery. Vacha mula (*Acorus calamus*), is mainly use in subsiding neurological symptoms of brain. Root of *Vacha* is very effective to improve grasping power, speech (language milestones) and learning performance, by declining brain lipid peroxide content. *Acharya Kashyapa* described *Samvardhana Ghrita* for the treatment of *Pangu* (Lame), *Muka* (Dumb), *Ashruti* (Deaf) and *Jada* (Mental deficient / Idiot) child. *Brahmi Ghrita* is very effective in strengthening memory and cognition impairment of CP children. *Ashtamangala Ghrita* enhance memory, cognitive function and regeneration of nerve as well as it protect from the infection. Ayushman-8 is very effective in *Manasika-mandata* (mental retardation) of children.

ACKNOWLEDGEMENT: I acknowledged the Sardar Patel Institute of Ayurvedic Medical Sciences & Research Centre. Lucknow, Uttar Pradesh, for providing library facility.

SOURCE OF SUPPORT: Nil

CONFLICT OF INTEREST: The authors declare that they have no conflict of interest.

ETHICAL APPROVAL: No ethical approval is required as no animals or humans have been used in the study.

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