

Therapeutic Effect of Kalyanaka Avaleha & Karma Basti in the Management of Spastic Cerebral Palsy in Children



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Abstract

Introduction: Cerebral Palsy (CP) is A group of neuromotor disorders that affect the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occur in the early stages of brain development. Disabled children are of great concern to the family as well as society. During the birth of a newborn baby, most prevalent cause, asphyxia, is characterized by hypoxia, hypercapnia, hypoventilation, and metabolic acidosis. If proper resuscitation is done in these children, then birth asphyxia is relieved but in case of failing it leads to several neurological disorders. Out of them, cerebral palsy is the most common. Cerebra are about the brain and palsy means paralysis. The brain injuries causing motor impairment in spastic cerebral palsy have no particular therapy in the traditional system. Although cerebral palsy is one of the most expensive chronic pediatric illnesses, there are currently symptomatic treatment options available. Therefore, in this problem lot of hope can be created with Ayurveda.

Material & Methods: 30 patients were taken, and Kalyanak Avleha was given in the dose of 40 mg/kg/day, and Karma Basti including 24 Anuvasana Basti with Prasarni Taila and [6] Asthapana Basti with Dashmooladi Kwatha was given for 90 days. Result- The result emphasizes that the Ayurvedic modality was incorporated with other therapeutic measures in the early intervention period for better improvement in CP. The results of 80% patients were statistically not significant proving physiotherapy as the standard management of Cerebral palsy.

Discussion: The muscle relaxant effect of the oral drug had given additional benefits in relaxing and nourishing the spastic and strenuous weakened muscles.

Conclusion: The trial also showed improvement in associated problems like seizures and drooling. Hence proving the efficacy of Ayurvedic modalities to be a new way of better management in the field of Cerebral palsy.

Keywords: Kalyanaka Avaleha; Karma Basti; Spastic cerebral palsy; Prasarni Taila

Introduction

Neuromotor disorders impact the development of posture and movement resulting in restrictions in activities associated with non-progressive issues occurring during early brain development [1]. Cerebral Palsy (CP) is a common problem, with the worldwide incidence being 2 to 2.5 per 1000 live births [2]. A few survey studies in India have shown an incidence of 2-4 per 1000, since mild cases are likely to be missed in a survey, the incidence may well be higher than the estimation [3]. There is not a single condition in Ayurveda that closely resembles cerebral palsy, however, many conditions have been explained in Ayurveda that resemble Cerebral Palsy (CP) such as Pangulya

(diplegia), Mookatva (dumb or aphasia), Jadtva (idiot or mentally retarding condition), Ekanga Rog (Monoplegia), Sarwanga Rog (Quadriplegic), and Pakshavadha (Hemiplegia), etc. However, Acharya Harita described a disease that is Abhighaten caused by brain injury [4]. It manifests as muscular spasticity and is considered incurable in nature. This condition can be considered Mastiskaghta Vata Vyadhi or cerebral palsy. Damage to the developing brain or abnormal development are the causes of cerebral palsy. This injury can happen in the first month of life, during pregnancy, during birth, or, less frequently, in the early years of infancy. Eighty percent of cases include structural issues

in the brain, most often in the white matter. It is estimated that problems that arise during pregnancy make up more than three-quarters of cases [5]. While there may be no known cause in some cases, common causes include issues with intrauterine development (radiation exposure, infection, fetal growth restriction, for example), brain hypoxia (thrombotic events, placental conditions), birth trauma during labor and delivery, and issues related to birth or childhood [6,7]. Children who have cerebral palsy (CP) typically exhibit motor impairments and developmental delays. Negative motor deficits include weakness, exhaustion, and incoordination, whereas positive motor deficits include spasticity, clonus, rigidity, and spasm. Neuronal loss resulting from insults can be of three types: extrapyramidal (basal ganglia)-which causes aberrant movements like choreoathetosis and cortical (pyramidal) which causes spasticity or mixed.

Up to 75% of cases with cerebral palsy are of the most prominent type, known as spastic palsy [8]. Children with cerebral palsy (CP) experience a variety of issues and may be permanently disabled. These issues include mental retardation, seizures, feeding issues, and visual and auditory abnormalities [9]. Due to a spectrum of limitations from slight to severe, the condition presents a therapeutic challenge for medical professionals. The child's condition makes them reliant on others to meet their requirements. The management of CP requires a multidisciplinary strategy. Worldwide, physiotherapy is recognized as the gold standard for rehabilitation treatment. The medical treatment of spasticity, seizures, and other conditions is complicated with both minor and major negative effects. As a result, the current conventional system does not have a specific treatment for brain damage restoration. Cerebral palsy is among the most expensive chronic pediatric conditions due to the available symptomatic therapy options [10]. As a result, families and parents are constantly looking for better, more affordable, and more potent alternative therapy solutions. Based on the etiopathogenesis of Ayurveda, cerebral palsy (CP) is a condition characterized by vitiation of all three Doshas, with a predominance of Vata presenting clinically throughout the body (Vatadhika Sannipata Sarvangaroga) with a brain lesion (Mastishka). Taking these perspectives into consideration, Ayurvedic practices such as Abhyanga, Bhasmasweda, Anuvasan Basti with Prasarni Taila, Niruha Basti with Dashmooladi Kwatha, and oral medicine Kalyanaka Avaleha. Ayurvedic treatment could reduce the problems by increasing brain activity, decreasing spasticity, and contractures along with improving the patient's life.

Need of Study

For cerebral palsy patients who have brain damage resulting in movement impairment, and abnormal development there is currently no specific treatment available in the Contemporary system. Spastic cerebral palsy is one of the most expensive chronic childhood illnesses due to limited symptomatic therapy choices. As a result, families and parents are constantly looking for better,

more affordable, and more potent alternative therapy solutions. Therefore, Ayurveda provides much promise for resolving this problem. Ayurveda is an eternal science that has well-defined principles to understand disease along with proper management. Ayurvedic treatment could reduce the challenges by strengthening the brain reducing spasticity and preventing the development of deformities and contractures along with improving his or her quality of life. To keep these things in mind here a study is planned to see the therapeutic effect of Kalyanaka Avaleha & Karma Basti in the treatment of children suffering spastic cerebral palsy.

Aims & Objective

- i. To decrease spasticity and prevent contractures and deformities from occurring.
- ii. The aim is to enhance gross motor function to achieve maximum independence.
- iii. To enhance the functional capacities of the children to make them self-dependent.
- iv. To improve the quality of life of children affected with Spastic Cerebral Palsy.
- v. To evaluate the therapeutic effect of Kalyanaka Avaleha in the management of spastic cerebral palsy in children.
- vi. To evaluate the therapeutic effect of Karma Basti in the management of spastic cerebral palsy in children.

Iec Registration No

- After receiving institutional ethics committee approval vide letter no DSRRAU/UCA/IEC/19-20/310, this study was initiated.
- The study was also registered in CTRI with registration number CTRI /2021/07/034864.

Study Design

1. Study Type: Interventional
2. Open labelled Study
3. Interventional Groups: Single Arm
4. Purpose: Treatment
5. Timing: 90 days
6. End Point: Efficacy

Material and Methods

Selection of cases

- i. **Source of patients:** Children with cerebral palsy were chosen from the outpatient and inpatient departments (OPD & IPD) of the Bal Roga Department of the attached Ayurved Hospital of the University Postgraduate Institute of Ayurved Studies and Research, Dr. S. R. Rajasthan Ayurved University Jodhpur.

ii. **Number of Patients:** 35 patients were registered for the present study but 5 patients were dropped out during the study. Therefore, the present study was completed on 30 patients.

iii. **Age of patients:** Children suffering from spastic cerebral palsy were of age groups one to sixteen years of either sex.

iv. **Follow-up:** Three monitoring times were done at monthly intervals during the study and follow-up was done after one month of completion of the study.

Diagnostic Criteria

Inclusion Criteria

- Children of age groups one to sixteen years of either sex were included which were stratified as 1-5 years, 5-10 years, and above 10 years.
- Diagnosed cases of Spastic Cerebral palsy were selected.

Exclusion Criteria

- Children below 1 year and above 16 years of age were excluded from study.
- Children suffering from any progressive neurologic disorders and any serious illness like meningitis, or encephalitis were excluded from the study.
- Children suffering from various disorders like myopathies, neuropathies, juvenile diabetes mellitus, essential hypertension, and any acute respiratory distress were excluded from the study.

Withdrawal Criteria

Patients who develop life-threatening complications during

treatment.

Parents/guardians are not willing to continue treatment.

Untoward Evaluation Criteria

To record adverse reactions an untoward reaction assessment form was developed, and all such adverse reactions were recorded.

Protocol of Research

- I. Consent of patient/attendant after making him/her aware of merits/demerits of trial with the duration of the proposed trial.
- II. Fulfillment of inclusion criteria.
- III. Registration of the patients.
- IV. The investigations mentioned were advised to them before presenting the formulation.
- V. The data obtained was clinically deducted and statistically analyzed.

Drugs

For the present study, two drugs were selected. Both drugs were Kalyanaka Avaleha (Table 1) & Prasarni Taila (Table 2) which are described under the chapter of Vata Vyadhi in Bhasijhaya Ratnavalli and Yogratanakar respectively. Preparation of Drug - Haridra, Vacha, Kustha, Pippali, Shunthi, Ajaji, Ajmoda, Yasthimadhu, and Saindhava lavana taken all the ingredients and grind these materials into a fine powder together and administered regularly with Goghrita or honey. Prepared Churna was packed in a sterile polybag of capacity 100 gm and labelled with the date of manufacturing, batch no., and drug license number.

Table 1: Ingredients of Kalyanaka Avaleha.

S. No.	Ingredients	Latin name	Part used
1	Haridra	Curcuma Longa (Linn.)	Rhizome
2	Vacha	Acorus Calamus (Linn.)	Root
3	Kustha	Saussuria Lappa (C.B. Clark)	Root
4	Pippali	Piper Longum (Linn.)	Fruit & Root
5	Shunthi	Zingiber Officinale (Rosc.)	Rhizome
6	Ajaji	Cuminum Cyminum (Linn.)	Seed
7	Ajmoda	Carum Roxburgianum (DC.)	Fruit
8	Yasthimadhu	Glycyrrhiza Glabra (Linn.)	Root
9	Saindhava lavana (Rock salt)	Sodium chloride	-

Table 2: Ingredients of Prasarni Taila.

S. No.	Ingredients	Latin name	Part used
1	Prasarni	Merremia Tridentata (Linn.)	Pancanga (Whole Plant)
2	Gand Prasarni	Paederia Foetida	Pancanga (Whole Plant)

3	Shunthi	Zingiber Officinale (Rosc.)	Rhizome
4	Rasna	Pluchea lanceolata (DC.)	Rhizome & Leaves
5	Yasthimadhu	Glycyrrhiza Glabra (Linn.)	Root
6	Tila Taila	Sessamum Indicum (Linn.)	Seeds Oil
7	Kanji	-	-
8	Dadhi(curd)	-	-

Dose & Duration - Kalyanaka Avaleha was given in the form of Churna in a dose of 40 mg/kg/day in two divided doses as per Young Formula. (Adult dose was considered as 3 grams).

Preparation of Drug

The whole plant of Prasarni collected and coarsely powdered should be placed in a vessel and decocted by adding water (till one-fourth is left) to this, curd, amla kanji in double quantity, and Kalka (paste) made from the following should be added, Tila Taila and subjected to Taila paka procedure to obtain Prasarni Taila (the Kalka Dravyas are- Manjistha, Haridra, Triphala, and Nagarmotha). This Prasarni Taila is highly useful as Nasya and for application. It relieves Ekanga Vata, Apasmara, Unmada, Vidradhi, Mandagni, Tvak-Vata, Sira, Sandhivata, and other Vata Roga. It is also indicated in veterinary practice. It imparts strength and, virility, useful for Vrddha, Bala, Stree, and kings. It is especially indicated in 'Pangu' for internal use.

Presentation of Drugs: Prepared oil was packed in a sterile bottle of capacity 100 ml and labeled with the date of manufacturing, batch no., and drug license number.

Aasthapana Basti: The dose of Basti Dravya was calculated using the (Kashyap Samhita/Khilasthan/Bastivisesaniya/109), as shown in the table below. For Aasthapana Basti, doses are mentioned in the given table.

Anuvasana Basti: The dose of Basti Dravya is calculated using the (Kashyap Samhita/khilasthan/Bastivisesaniya/109), as shown in the table below. For Anuvasana Basti, these dosages are

Table 3: Age-wise dose of Aasthapana Basti.

Age in year	Aasthapana Basti	Quantity
Up to 3 years	9 Karsha	103.5 gm
4-5 years of age	3 Pala	153 gm
6 to 11 years	3 Prastha	276 gm
12-15 years	6 Prastha	552 gm

(1 Karsha=11.5 Gm, 1 Pala=4 Karsha=46 Gm, 1 Prastha= 2 Pala, 1ml=0.92gm)

Table 4: Age-wise dose of Anuvasana Basti.

Age in year	Anuvasana Basti	Quantity
Up to 3 years	3 karsha	34.5 gm
4-5 years of age	1 pala	46 gm
6 to 11 years	1 prastha	92 gm
12-15 years	2 prastha	184 gm

mentioned.

Assessment Criteria

- Gross motor function Classification Scale (GMFCS)- to study gross motor function.
- Modified Ashworth scale- to measure the change in spasticity.
- Modified Barthel's Scale of Advance daily living- to see changes in the Quality of life of Spastic cerebral palsy.

Clinical Study

30 patients satisfying the selection criteria were registered in the study, after following the standard informed consent procedure. Out of these two patients dropped out due to personal family problems and three patients due to acute respiratory distress and suspected pneumonia-like conditions.

Observations

The detailed observations, regarding demographic data, socio-economic status, parental history, family history, personal history, and complete history of the patient regarding the disease were collected as shown in given table below.

Result

The software was used to calculate all of the outcomes: In-Stat Graph Pad 3.0. The Wilcoxon matched pairs test was used for nonparametric data, while for Parametric Data Paired 't-Test' were used and results were calculated. Results as shown in Tables 6- 9.

Table 5: Showing Observations During the Present Study.

S.no.	Particulars	Prevalence	Percentage
1.	Age (years)	01-May	46.66%
2.	Sex	Male	76.66%
3.	Religion	Hindu	90%
4.	Socio-economic status	Lower class	53.33%
5.	Habitat	Urban	76.66%
6.	Mother education	Up to high school	56.66%
7.	Father education	Graduate	60%
8.	Dietary habits	Vegetarian	71%
9.	Sharirika Prakriti	Pitta-Kaphaja	56.66%
10.	Mansika prakriti	Rajja-tama	60%
11.	Samhanana	Madhyam	50%
12.	Satmaya	Sarvarasa	50%
13.	Satva	Madhyam	53.33%
14.	Sara	Mansasara	33.33%
15.	Aharasakti	Madhyam	50%
16.	Jaran Shakthi	Madhyam	58%
17.	Vyamshakthi	Madhyam	53.33%
18.	Vaya	Bal	100%
19.	Agni	Mandagni	50%
20.	Desha	Jangal	100%
21.	Koshata	Mrudu	56.66%
22.	Nidra	Alpa	40%
23.	Family structure	Nuclear	83.33%
24.	Educational status of the patient	Not started school	66.66%
25.	Maternal antenatal history	Prolonged labour	20.00%
26.	Mode of delivery	Normal	46.66%
27.	Gestation	Full term	66.66%
28.	Birth weight	LBW	46.66%
29.	Specific natal history	Delay crying	33.33%
30.	Requirement of assisted medical care	Hospital admitted	70%
31.	Signs & symptoms	Feeding problem	30%
32.	Types of C.P.	Spastic	86.66%
33.	Subtypes of Cerebral Palsy	Moderate	53.33%
34.	GIT Problems	Feeding difficulties	36.66%
35.	Dietary pattern	Semisolid	83.33%
36.	Status of immunization	Complete	63.33%
37.	Family history	No history	96.66%
38.	Treatment history	Anti-epileptic drugs	66.66%

Table 6: Showing the effect of Karma Basti along with Kalyanaka Avaleha on Modified Ashworth Scale.

Name of The Muscles	BT	AT	difference	Change (%)	SD	SE	P	R
Left Deltoid Muscle	2.567	2.167	0.4	15.5823919	0.4983	0.09097	>0.005	NS
Right Deltoid Muscle	3.1	2.267	0.8333	26.88064516	0.5921	0.1081	> 0.005	NS
Left Biceps Muscle	2.6	2.067	0.5333	20.51	0.5074	0.09264	> 0.005	NS
Right Biceps Muscle	3.133	2.4	0.7333	23.4	0.4498	0.08212	> 0.005	NS
Left Triceps Muscle	2.633	2	0.6333	24.0524117	0.5561	0.1015	<0.005	NS
Right Triceps Muscle	3.1	2.4	0.7	22.58064516	0.596	0.1088	< 0.005	NS
Left Rectus Femoris muscles	3.2	2.733	0.4667	14.584375	0.5074	0.09264	< 0.005	NS
Right Rectus Femoris muscles	3.2	2.933	0.2667	8.334375	0.4498	0.08212	< 0.007	NS
Left Quadriceps Muscles	3.1	2.5	0.6	19.35483871	0.4983	0.09097	< 0.005	NS
Right Quadriceps Muscles	3.6	2.9	0.7	19.44	0.535	0.09767	< 0.005	NS
Left Gastrocnemius Muscle	3.167	2.5	0.6667	21.05146827	0.4795	0.08754	< 0.005	NS
Right Gastrocnemius Muscle	3.2	2.8	0.4	12.5	0.4983	0.09097	< 0.001	NS

Table 7: Showing the effect of Karma Basti along with Kalyanaka Avaleha on Modified Barthel Scores.

Name of Activity	BT	AT	difference	Change (%)	SD	SE	P	R
Personal hygiene	2.3	1.233	1.067	46.39130435	0.4983	0.09097	< 0.001	NS
Bathing self	2.2	1.233	0.9667	43.94090909	0.6687	0.1221	< 0.001	NS
Feeding	4.967	2.933	2.033	40.93013892	1.402	0.2559	< 0.001	NS
Toilet	3.867	2.033	1.833	47.40108611	1.206	0.2202	< 0.001	NS
Stair Climbing	4	1.967	2.033	50.825	1.129	0.2061	< 0.001	NS
Dressing	4.7	3.033	1.667	35.46808511	1.918	0.3502	< 0.001	NS
Bowel Control	3.133	2.033	1.1	35.1101181	1.322	0.2414	< 0.001	NS
Bladder Control	3.067	1.967	1.1	35.86566678	1.322	0.2414	0.002	NS
Ambulation (wheelchair)	1.767	0.9333	0.8333	47.1590266	0.8339	0.1523	< 0.001	NS
Chair-bed transfer	4.533	1.7	2.833	62.49724244	2.069	0.3778	< 0.001	NS

Table 8: Showing the effect of Karma Basti along with Kalyanaka Avaleha on GMFSC Scale.

Parameters in GMFSC Scale	BT	AT	difference	Change (%)	SD	SE	P	R
Neck Flexion	2.033	1.567	0.4667	29.7830249	0.5074	0.09264	< 0.001	S
Neck Extension	1.967	1.567	0.4	20.3355363	0.5632	0.1028	<0.0023	S
Left Shoulder Abduction	2.133	1.6	0.5333	33.33125	0.5074	0.09264	< 0.001	S
Right Shoulder Abduction	2.067	1.6	0.4333	27.08125	0.5683	0.1038	< 0.001	S
Left Shoulder Flexion	2.167	1.6	0.5667	35.41875	0.504	0.09202	< 0.001	S
Right Shoulder Flexion	2	1.567	0.4333	27.6515635	0.5683	0.1038	0.0015	S
Left Elbow Flexion	2.1	1.567	0.5333	25.3952	0.5074	0.09264	< 0.001	S
Right Elbow Flexion	1.933	1.567	0.3667	18.9705	0.4901	0.08949	0.001	S
Left Elbow Extension	2.033	1.567	0.4667	22.9562	0.5074	0.09264	< 0.0001	ES
Right Elbow Extension	1.9	1.567	0.3333	17.5421	0.4795	0.08754	0.002	S
Left Wrist Flexion	1.833	1.533	0.3	16.3666	0.4661	0.0851	0.0039	ES
Right Wrist Flexion	1.7	1.467	0.2333	13.7235	0.4302	0.07854	0.015	S
Left Wrist Extension	1.8	1.533	0.2667	14.81666667	0.4498	0.08212	0.0078	S
Right Wrist Extension	1.733	1.533	0.2	11.5406809	0.4068	0.07428	0.03	S
Left Hip Flexion	1.833	1.5	0.3333	18.18330606	0.4795	0.08754	0.002	ES
Right Hip Flexion	1.667	1.5	0.1667	10	0.379	0.0692	0.062	NS

Left Hip Extension	1.7	1.467	0.2333	13.72352941	0.4302	0.07854	0.015	S
Right Hip Extension	1.767	1.533	0.2333	13.20316921	0.4302	0.07854	0.0156	S
Left Knee Flexion	1.733	1.533	0.2	11.5407	0.4068	0.07428	0.0313	S
Right Knee Flexion	1.833	1.567	0.2667	14.54991817	0.4498	0.08212	0.007	VS
Left Knee Extension	1.667	1.5	0.1667	10	0.379	0.0692	0.0625	NS
Right Knee Extension	1.767	1.533	0.2333	13.20316921	0.4302	0.07854	0.0156	S
Left Ankle dorsiflexion	1.767	1.567	0.2	11.31861913	0.4068	0.07428	0.031	S
Right Ankle dorsiflexion	1.833	1.567	0.2667	14.54991817	0.4498	0.08212	0.007	VS

Table 9: Assessment of Overall Improvement.

S. No.	Assessment of Result	No. of patients	% Relief
1	Maximum improvement (>75% of improvement)	0	0%
2	Moderate improvement (> 50% to 75% of improvement)	0	0%
3	Mild improvement (> 25% to 50% of improvement)	6	20%
4	No improvement (< 25% of improvement)	24	80%

Discussion

In Ayurvedic research, no illness or symptom combination is comparable to Cerebral Palsy. It can be classified as Vata dominating or Vatavyadhi based on its genesis, pathophysiology, and clinical symptoms. Small variations in Doshika participation are likely to arise when evaluating certain types of illnesses. The aetiology, pathology, signs, and symptoms of Athetoid and Ataxic CP all point to Vata Vyadhi, which is caused by Dhatukshaya. Because there is Stabdghata and reduced Sandhi movement in Spastic type of CP, the signs and symptoms imply Vata Vyadhi is related to Aavarana. Phakka, Pangulya, Mukatva, Jadatva, Ekanga Roga, Sarvanga Roga, Pakshaghata, and Pakshavadha, for example, are some of the circumstances found discreetly throughout Samhita. Even before the fetal period, the care of the unborn child is a major issue. These subjects cover both the prevention and treatment of childhood illness. Inappropriate Ritu, Kshetra, Ambu, and Bija [11], Dauhrada Avamana [12] (ignorance of impulses during the Dauhrada-period of pregnancy), the existence of Garbhpaghatkarbhavas [13], incompatible Garbha Vriddhikarabhava [14], and unsuitable Garbhini Paricharya [15] may have an adverse influence on the foetus in utero [16]. Furthermore, during and after birth, Akala Pravahana, Shiromarmabhighata, defects in the Prana Pratyagamana process, Ulbaka, Nabhi Nadi Vikara, Graha Roga, incorrect Shishu Paricharya, and other factors may play a part as causal factors. These obstruct a child’s natural growth and development, resulting in a variety of disorders, malformations, and even death. It provides insight into some of the circumstances or events that contribute to the development of these co-morbid

illnesses. Preventive factors are given higher priority in order to reduce their occurrence, and this is the only approach to deal with diseases with a high incidence and no definitive solution. This is an often overlooked or disregarded region that requires care. The disappointment over the lack of a decrease in the prevalence of CP despite advances in perinatal care is best understood in the perspective of current knowledge that the aetiology of most cases of CP is prenatal in nature. As a result, the treatment approach primarily focuses on Vata Vyadhi control. Treatment for Vata Doshha includes a range of Panchakarma treatments such as Snehana, Swedana, and Basti, among others. Basti is regarded to be the most important and helpful of these methods for curing Vata Doshha. According to clinical practice and continuing research, these techniques are more effective in improving illness status than merely medicine or physiotherapy. However, the disease is incurable, Ayurvedic science can help lead in the right direction by enhancing the quality of life of children who have a longer life expectancy. Efforts should be made to find any improvement or respite in the disease’s status.

Effect of Karma Basti along with Kalyanaka Avaleha on Modified Ashworth Scale

The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. deltoid muscle, Lt., and Rt. biceps muscle, Lt. and Rt. triceps muscle, Lt., and Rt. rectus femoris muscle and Lt. and Rt. quadriceps muscle and Lt. and Rt. gastrocnemius muscle at the end of the trial showed statistically not significant (Table 6).

Effect of Karma Basti along with Kalyanaka Avaleha on Modified Barthel Scores

The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in personal hygiene, self-bathing, feeding, toilet, Stair climbing, dressing, bowel control, bladder control, ambulation (wheelchair), and chair-bed transfer at the end of the trial and showed statistically not significant (Table 7).

Effect of Karma Basti along with Kalyanaka Avaleha on GMFSC Scale

The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in neck flexion, neck extension, Lt., and Rt. Shoulder Abduction, Lt. and Rt. shoulder flexion, Lt., and Rt. elbow flexion, Lt., and Rt. Elbow extension at the end of the trial showed statistically extremely significant and statistically significant. The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. wrist flexion at the end of the trial showed statistically extremely significant and statistically significant. The effect of combining Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. wrist extension at the end of the trial showed statistically significant. The effect of combining Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. hip flexion at the end of the trial showed statistically extremely significant and statistically not significant. The effect of combining Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. shoulder Abduction at the end of the trial showed statistically significant. The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. knee extension at the end of the trial showed statistically not significant and statistically significant. The effect of combining Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. Knee flexion at the end of the trial showed statistically significant and statistically very significant. The effect of combined Karma Basti along with Kalyanaka Avaleha treatment was observed in Lt. and Rt. ankle dorsiflexion at the end of the trial showed statistically significant and statistically very significant (Table 8).

Probable Mode of Action of Kalyanka Avaleha

“Kalyanka Avaleha” is selected which is described in Bhaisajya Ratnavalli under the chapter of Vata Vyadhi. It is indicated for a healthy child’s smooth and quick growth without interruption from disease, as well as for improving or curing impaired conditions in people who are Jadata (idiot [17] or mentally retarding condition), Gadgadatva (speech defects), and Mukatva (dumb). Kalyanka word denotes uninterrupted growth, development, and welfare of a person or group in their health, comfort, and prosperity. Growth and development imply physical and physiological maturation respectively. Though it is explained in Vata Vyadhi, the assimilation of the drug properties probably may have better efficacy if given through the oral route. It contains Haridra, Vacha, Kushth, Pippali, Shunthi, Ajaji, Ajmoda, Yasthimadhu, and Saindhava.

Prasarni Taila was prepared as per the method described in Bhaisajya Ratnavalli. In this method, Kalka is mentioned to be added as compared to the usual Taila Paka Vidhi. Most of the drugs are Madhura Rasa, Ushna Veerya, and Madhura Vipaka. Kalyanka Avleha is indicated to be used regularly e.g., for 21 days. It cures Jadata (mentally retarding condition), Gadgadatva (speech defects), and Mukatva (dumb) which shows their efficacy to target motors, sensory, and higher functions. Manifestation of the above-mentioned conditions is only possible with impaired function of Gyanendriya, Karmendriya, and Mana. Mashtishka is described as the seat (place) of all Indriya. For the correction of impaired functions of those Indriya, the drug is expected to work at the same level.

Definite indication of this preparation for this condition can be said as a group of syndromes and improvements shown in this clinical study indicate their usefulness in conditions like cerebral palsy. It can be understood with the Vikrutivishamasamavaya, of this formulation. The study drug Ayurvedic yoga is a formulation containing nine herbal Ayurvedic drugs. The selection of ingredients was based on the support to improve the status of CP patients in various aspects. Brain injury may outcome in cerebral palsy, but there is increasing evidence that the brain can heal from such injuries because neurons and other brain cells are plasticity, that is, they can change in shape and function in response to both internal and external stimuli. The term “neuroplasticity” describes how experience and training can alter the structure and function of the brain. The organ that is intended to adapt to experience is the brain. Donal Hebb, a Canadian neurologist, states that synapses are maintained and reinforced when cells are working together. The maintenance and fortification of neurons heavily depend on action. Frequently activated neurons and synapses are kept, whereas inactive neurons and synapses are removed. The first few years of life are when the brain is most plastic, but it continues to be less so throughout life. Therefore, early intervention throughout the early stages of life can affect the brain more profoundly. With its nootropic, neuro-regenerative, and neuroprotective qualities, this medication can create an environment in the brain that encourages brain development. Drugs having a neuroprotective role are Curcumin [18], Vacha (S. R. Yendeet et al., 2009); (Shukla PK, et al 2009.); Pippali (Min Fu et al. 2010); Yasthimadhu- (Muralidharan et al 2009). Drugs having anticonvulsant action Yasthimadhu (Nassiri-Aslet et al 2007). The main purpose of selecting this formulation was to balance the vitiated Vata. So, this formulation includes Vatahara drugs with Medhya, Balya, Rasayana, and Brimhana properties were selected for the study.

Probable mode of Action of Abhyanga, Swedana & Basti

Abhyanga and Swedana:

Bahya & Abhyantara [19] are the two forms of Snehana Karma. Bahya Snehana was performed as Sarvanga Abhyanga (full body massage) using Prasarni Taila, and Swedana was performed

by Nadi Swedana as Sarvanga Swedana. There are two ways of presuming the effect of Abhyanga: by physical manipulation or through the drug's medicinal effect in medicated Taila. Massage therapy is a type of physical manipulation that improves blood and plasma circulation, strengthens and stimulates the lymphatic system, and helps flush out internal waste. Neural endings located in skin and muscle spindles are activated, causing muscles and deep connective tissues to relax. Prasarni Taila was selected for Abhyanga containing Prasarni and Tila Taila as the main ingredients. According to the concepts of Ayurveda, Sneha diffuses in the body through the minute hair follicles of the skin and is dissolved by Bhrajaka Pita [20]. Tila is a Sneha dravya having properties opposite to the properties of vitiated Vata. It certainly cures hemiplegia, paralysis/quadruplegia, epilepsy, psychosis, depletion of digestive fire, Vata afflictions of the skin, blood vessels, joints (small), bones (big), and all other Vata ailments. Hence, Prasarni Taila acts through the combined properties of both these drugs. With the help of the Vatahara property, Prasarni Taila controls the vitiated Vata, which is the main factor in the pathogenesis of cerebral palsy. Abhyanga carried out in this study has provided relief to the symptoms by pacifying vitiated Vata. Mridu, Ushna, and Sukshma Guna of Taila have aided in relieving the stiffness of the muscle. Abhyanga if performed for a longer time on affected muscles, the maximum relief in stiffness can be achieved and reduction in tendon reflexes and hypertonia can be achieved by the Nadibalya and Brimhana properties of the drug, which gives strength to the nerves. The drug is also considered as having the Balya property, which increases the diminished muscle power. With the help of Suksma Guna, the drug can enter fine channels (Srotasa) and help in the correction of Srotodusti. This fact has also been supported by the findings of the present study as Abhyanga along with Swedana provided significant relief in major symptoms of cerebral palsy like spasticity, exaggerated tendon reflex, diminished muscle power, etc. [21,22] This strengthening fomentation is also employed frequently in neurological disorders, malnutrition of limbs, arthritis, and other many diseases [23].

Conclusion

By the above study, it was concluded that the Ayurvedic modality should be incorporated with other therapeutic measures in the early intervention period for better improvement in CP. The results of all the patients were most of the time statistically not significant ($p < 0.001$) proving physiotherapy as the standard management of Cerebral palsy. Hence proving the efficacy of Ayurvedic modalities to be a new way of better management in the field of Cerebral palsy. The muscle relaxant effect of the oral drug had given additional benefits in relaxing and nourishing the spastic and strenuous weakened muscles. Improvement in the power and decrease in spasticity of the upper limb area aided in the improvement of daily activities. The study also showed improvement in associated problems like seizures and drooling. However, no adverse effects of procedure and drug were seen

during this study.

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