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EFFICACY OF AYURVEDIC THERAPIES IN THE MANAGEMENT OF SPASTIC CEREBRAL PALSY IN CHILDREN

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ABSTRACT

Cerebral palsy (CP) poses significant challenges, and this study explores Ayurvedic therapies' effectiveness in managing spastic CP in children. CP results from non-progressive brain disturbances during early development and presents various clinical manifestations, including spasticity, dyskinetic movements, and more.[2] Ayurveda, while lacking an exact match for CP, sees it as a *Vata*-dominant condition affecting the entire body.[3] All 30 children were given *Ashwagandha Ghrita*[4] orally with *Ksheerabala Taila Abhyanga* and *Matra Basti*. The duration of treatment was 90 days. The results revealed marked and moderate improvements in 66.67% and 23.33% of patients, respectively, emphasizing the potential of Ayurvedic treatments in enhancing the quality of life and functional capacities of children with spastic CP.

Keywords: Ayurveda Therapies, Spastic Cerebral Palsy, *Ashwagandha* (Withania Somnifera) *Ghrita*, *Ksheerabala* (Sida cordifoliya Linn) *Taila*, *Abhyanga*, *Matra Basti*, *Vaspa Swedan*.

INTRODUCTION

Cerebral palsy (CP) represents a complex and multifaceted group of neuromotor disorders that significantly impact the development of posture and movement, leading to considerable restrictions in daily activities. This condition arises from non-progressive disturbances occurring during the early stages of brain development, affecting fetal or infant brains. CP's manifestations extend beyond motor disorders and often include disturbances in sensation, cognition, communication, perception, and even seizures. Its etiology is closely linked to antenatal and perinatal factors, with postnatal causes like infections, head injuries, and hyperbilirubinemia playing crucial roles. The primary locus of CP's pathology resides in the developing brain, particularly affecting regions such as the cerebrum, brain stem, basal ganglia, and cerebellum.

In the context of Ayurveda, CP defies a direct correspondence with any single ailment described in classical texts. Nevertheless, considering the pathogenesis of the condition, CP can be perceived as a *Vata*-predominant ailment that may manifest in various clinical presentations, including Spastic Monoplegia (*Ekanga Roga*[5]), Hemiplegia (*Pakshavadha*[6]), Spastic Diplegia (*Pangu*[7]), Spastic Quadriplegia (*Sarvanga Roga*[8]), Dyskinetic (*Kampa Vata*[9] */ Cheshtavriddhi*), and Ataxia (*Chalatva*), all categorized under *Vata Vyadhi* in Ayurvedic texts.[10] *Marmaghata* is one of the factors considered responsible for the onset of *Vata Vikara*.

This multifaceted ailment, with its multisystem involvement, demands a comprehensive and multidisciplinary approach, calling for therapeutic interventions with multifactorial effects. In light of these complexities and the limitations of conventional medical approaches, this study seeks to explore the therapeutic potential of Ayurveda in the management of CP, specifically examining the effects of *Ashwagandha Ghrita* and *Ksheerabala Taila* through *Abhyanga* and *Matra Basti*.[11] Such Ayurvedic interventions aim to address the root causes and improve the quality of life for children grappling with the challenges of spastic CP.

Need of Study: This study is essential due to the lack of targeted therapies for brain injuries in spastic cerebral palsy within conventional medicine. Existing treatments can be financially burdensome for families. Ayurveda offers a cost-effective and holistic alternative with the potential to improve the quality of life for affected children. Thus, this research investigates the effectiveness of Ayurvedic therapies, specifically *Ashwagandha Ghrita* and *Ksheerabala Taila*[12], in managing spastic cerebral palsy, addressing a critical need for alternative treatment options.

Methodology

This study aims to investigate the effectiveness of *Ashwagandha Ghrita* and *Matra Basti*, along with other Ayurvedic therapies, in managing Spastic Cerebral Palsy in children. We will assess how these treatments impact spasticity, motor function, and overall well-being through controlled clinical trials. The goal is to enhance the quality of life for affected children by improving their functional independence. By evaluating these Ayurvedic interventions and their impact, we aim to contribute valuable insights to the care and well-being of children with Spastic Cerebral Palsy.

IEC Approval

The institutional ethics committee's approval was taken for the randomized controlled clinical study. IEC order No. DSRRAU/UPGIAS&R/IEC/20-21/410

CTRI Registration No. CTRI/2022/09/045479

STUDY DESIGN

In this clinical study conducted at the *Balaroga* Department of Sanjeevani Ayurveda Hospital, affiliated with Dr Sarvepalli Radhakrishnan Rajasthan Ayurved University in Jodhpur, Rajasthan, a total of 36 patients were initially registered. However, due to specific circumstances such as financial constraints and incomplete treatments, 6 patients did not complete the 90-day study. Consequently, the research was successfully completed with 30 patients. The study, categorized as a Single-Arm Open-label Clinical Study, spanned a period of 90 days, during which patients were

monitored monthly. Additionally, follow-up assessments were conducted one month after the completion of the study period. This comprehensive approach to patient selection, study type, and duration, along with diligent follow-up procedures, contributes to the robustness and reliability of the research outcomes.

POSOLOGY

In Ayurveda, the preparatory stage, *Purva Karma*, involves a sequence of therapies to ready the body for the main treatment. It starts with a full-body oil massage (*Bahya Snehana*) using *Ksheerabala Taila*, followed by a mild steam therapy (*Bahya Swedan*) to open the body's channels. *Ashwagandha Ghrita* is then taken orally in divided doses, and a rectal enema (*Matra Basti*) is administered. These therapies are complemented by the intake of oral medicine with lukewarm milk. Always consult with a qualified Ayurvedic practitioner for personalized and safe treatment.

(B) Diagnostic Criteria-

Inclusion Criteria

"In our study, we included children aged 1 to 10 years of both sexes diagnosed with Spastic Cerebral Palsy. We prioritised those with earlier diagnoses for timely intervention, and our scope encompassed all forms of Spastic Cerebral Palsy, regardless of their distinct causes or etiologies."

Exclusion Criteria-

"In our study, we didn't include children with certain conditions. We left out those with progressive neurological disorders like meningitis or encephalitis because they have different problems. We also excluded children with other health issues like myopathies, neuropathies, Juvenile diabetes mellitus, high blood pressure, and any acute respiratory problems."

Withdrawal Criteria-

- Patients who create life- debilitating complications during treatment.
- Parents/guardians are not willing to continue treatment.

SELECTION OF TRIAL DRUG: -

A. *Ashwagandha Ghrita*: - The "*Ashwagandha Ghrita*" selected for the present study is mentioned in *Bhaishajya Ratnawali Balarog Prakarana*. The basis of the selection of this drug is a lot of work has been done on this that has proven in Gross Motor milestones, Fine Motor milestones, Social and language milestones, and Spasticity.

Table No 1. INGREDIENT OF *ASHWAGANDHA GHRITA*

S. No	Ingredient	Latin Name	Part used
1.	*Ashwagandha*	*Withania somnifera*	Root
2.	*Ksheera*	Milk	Whole
3.	*Ghrita*	Ghee	Whole
4.	Jala	Water	Whole

Drug dose and Duration: Doses were according to the body weight of the child (1ml/ kg/day) in two divided doses for 90 days!

B. *KSHEERABALA TAILA*: The drug *Ksheerabala Taila* selected in the present study is based on the classical reference from the '*Sahasrayogam*' for *Abhyanga* and *Matra Basti*.

Table No 2. INGREDIENT OF *KSHEERABALA TAILA*

S. No.	Ingredient	Latin Name	Part Use
1.	*Bala*	*Sida cordifoliya Linn.*	Root
2.	*Tila*	*Sesamum indicum*	Seed (Oil)
3.	*Ksheera*	Cow Milk	Whole

PANCHAKARMA PROCEDURES

Panchakarma is a set of traditional Ayurvedic procedures aimed at detoxifying and rejuvenating the body. It includes *Abhyanga*, an oil massage using *Ksheerabala Taila* to balance the *Vata dosha, Vaspa Swedan*, a steam therapy, and *Matra Basti*, an anorectal medication administration with *Ksheerabala Taila*. *Abhyanga* should be done for 15-30 minutes twice daily for 90 days, followed by a 10 -15-minute *Vaspa Swedan* session after *Abhyanga*. *Matra Basti* is given once daily after *Abhyanga* and *Swedan*, with the dose determined by age-specific guidelines from Ayurvedic texts. These procedures require expert guidance and customization based on individual needs and should be administered by qualified Ayurvedic practitioners.

Table No 3. Dose of *Matra Basti* according to Age: -

Age in Year	Dose in *Tola*	Dose in ml [15-16]
01 year	¼ *Tola*	3 ml
02 years	½ *Tola*	6 ml
03 years	¾ *Tola*	9 ml
04 years	01 *Tola*	12 ml
05 years	1 ¼ *Tola*	15 ml
06 years	1 ½ *Tola*	18 ml
07 years	1 ¾ *Tola*	21 ml
08 years	02 *Tola*	24 ml
09 years	2 ¼ *Tola*	27 ml
10 years	2 ½ *Tola*	30 ml

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.

After the three follow-ups were finished, the assessment was carried out. A scoring system was devised to assess the pace of improvement. Following therapy, the outcome is classified as follows based on the percentage of alleviation:

OBSERVATION: -In the present study, 30 patients were registered final for trial. All 30 patients completed the whole treatment in 90 days and their observations are shown below.

Table No 4.

Particulars	Maximum Observation	Percentage
Age	1-5 year	60 %
Agni	*Manda Agni*	50 %
Kostha	*Krura*	50 %
Nidra	*Disturbed*	66.67 %
Mala	*Baddha*	53.33 %
Mutra	*Prakrit*	86.67 %
Samhanana	*Madhyama*	60 %
Satmaya	*Avar*	90 %
Satva	*Avar*	73.33%
Sara	*Madhyasara*	100 %

Ahara shakti	*Avar*	56.67 %
Vyayam shakti	*Avar*	73.33 %
Vaya	*Balya vastha*	100 %
Family structure	Nuclear	51 %
Birth Order	First	56.67 %
Birth Weight	Normal	50%
First Cry After Birth	Delayed cry	66.67%
Subtype-wise	Diplegia	40%
Sign & Symptoms	Global Developmental delay	46.66%
GIT Problem	Excessive salivation	36.66%

RESULTS

The combined treatment of *Ashwagandha Ghrita* and *Ksheerabala Taila Matra Basti* showed significant improvements in the GMFCS scale at the end of the trial, with a notable gain of 45.28% within 90 days.

Table No 5.

Parameter	**Mean**		**Median**		**SD**			**Wilcoxon W**	**P-Value**	**%**	**Result**
	BT	**AT**	**BT**	**AT**	**BT**	**AT**	**Diff.**			**Effect**	
GMFCS SCALE	3.53	1.93	3.50	2.00	0.86	0.83	1.60	-3.920[b]	0.0087	45.28	Sig
Modified Ashworth Scale – Lt Upper Limb	3.03	1.47	3.00	1.00	0.72	0.73	1.57	-3.904[b]	0.0094	51.65	Sig
Rt Upper limb	3.07	1.43	3.00	1.50	0.64	0.63	1.63	-3.928[b]	0.0083	53.26	Sig
Lt Lower Limb	3.07	1.77	3.00	2.00	0.69	0.77	1.30	-3.910[b]	0.0091	42.39	Sig
Rt Lower Limb	3.13	1.67	3.00	2.00	0.73	0.71	1.47	3.932[b]	0.0081	46.81	Sig
Modified Barthel Scale Grooming (Personal hygiene)	1.13	2.87	1.00	3.00	1.22	1.43	1.73	-3.788[b]	0.0016	60.47	Sig
Bathing	0.73	2.43	0.00	3.00	1.11	1.45	1.70	-3.818[b]	0.0014	69.86	Sig
Feeding	1.40	4.57	0.00	2.00	1,85	3.13	3.17	-3.861[b]	0.00117	69.34	Sig
Toilet Transfers	1.20	4.10	0.00	5.00	1.75	2.25	2.90	-3.871[b]	0.0011	70.73	Sig
Stair climbing	1.50	4.87	0.00	5.00	2.10	3.00	3.37	-3.849[b]	0.00124	69.18	Sig
Dressing	1.53	4.30	0.00	3.50	2.21	3.15	2.77	-3.612[b]	0.00399	64.34	Sig
Bowel control	1.53	4.93	0.00	5.00	1.96	2,82	3.40	-3.837[b]	0.00132	68.92	Sig
Bladder control	2.30	5.47	2.00	5.00	1.99	2.64	3.17	-3.813[b]	0.00149	57.93	Sig
Ambulation (wheelchair)	1.70	6.50	0.00	5.50	2.53	4.27	4.80	-3.685[b]	0.00279	73.85	Sig

Chair/Bed Transfer	1.47	6.23	0.00	5.50	1.93	4.03	4.77	-3.689[b]	0.00274	76.47	Sig

Table No 6. OVERALL EFFECT

Overall Effect	No of Patients	Percentage
Marked Improvement	7	23.33%
Moderate Improvement	20	66.67%
Mild Improvement	3	10.00%
No Improvement	0	0.00%
TOTAL	30	100.00%

The above table shows that the oral administration of *Ashwagandha Ghrita* and *Matra Basti* by *Ksheerabala Taila* was observed that 66.67% of patients had moderate improvement, 23.33% of patients had marked improvement and 10% had mild improvement.

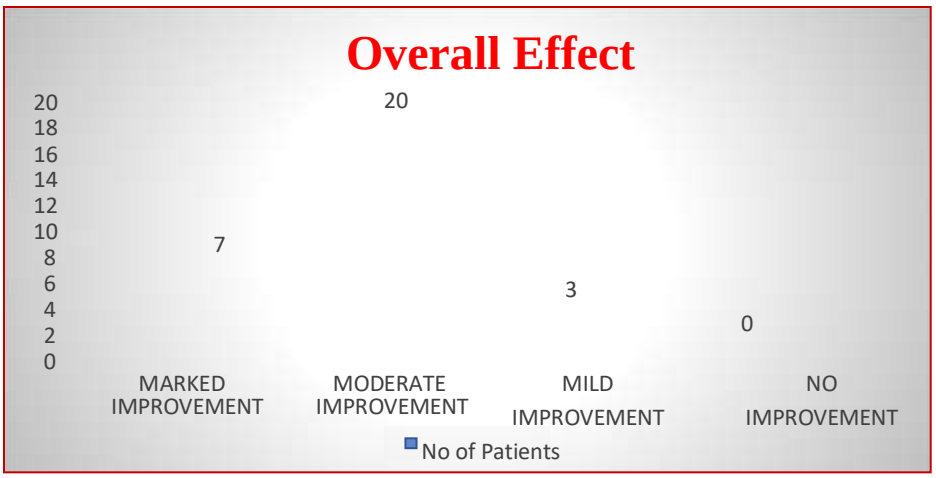

Table No 7. Observation of After treatment and after follow-up.

Parameter	Mean		Diff	% Change	Median		SD		Wilcoxon W	P-Value	Result
	AT	AF			AT	AF	AT	AF			
GMFCS SCALE	1.9 3	1.8 7	0.0 7	3.45	2.0 0	2.0 0	0.8 3	0.8 2	-1.414[b]	0.15 7	NS
Modified Ashworth Scale – Lt Upper	1.4 7	1.4 3	0.0 3	2.27	1.0 0	1.0 0	0.7 3	0.7 3	-1.000[b]	0.31 7	NS
Rt Upper	1.4 0	1.3 3	0.0 7	4.76	1.0 0	1.0 0	0.6 2	0.6 1	-1.414[b]	0.15 7	NS
Lt Lower	1.7 7	1.7 0	0.0 7	3.77	2.0 0	2.0 0	0.7 7	0.7 9	-1.414[b]	0.15 7	NS
Rt Lower	1.6 7	1.6 3	0.0 3	2.00	2.0 0	1.5 0	0.7 1	0.7 2	-.447[b]	0.65 5	NS

Modified Barthel Scale Grooming (Personal hygiene)	2.8 7	2.8 0	0.0 7	2.33	3.0 0	3.0 0	1.4 3	1.4 5	-1.414[b]	0.15 7	NS
Bathing	2.4 3	2.3 3	0.1 0	4.11	3.0 0	2.0 0	1.4 5	1.4 2	-1.342[b]	0.18 0	NS
Feeding	4.5 7	4.4 3	0.1 3	2.92	2.0 0	2.0 0	3.1 3	3.0 4	-1.414[b]	0.15 7	NS
Toilet Transfers	4.1 0	4.1 0	0.0 0	0.00	5.0 0	5.0 0	2.2 5	2.2 5	.000[c]	1.00 0	NS
Stair climbing	4.7 3	4.7 3	0.0 0	0.00	5.0 0	5.0 0	2.9 1	2.9 1	.000[c]	1.00 0	NS
Dressing	4.2 3	4.2 3	0.0 0	0.00	2.5 0	2.5 0	3.1 6	3.1 6	.000[c]	1.00 0	NS
Bowel control	4.5 3	4.5 3	0.0 0	0.00	4.5 0	4.5 0	2.7 5	2.7 5	.000[c]	1.00 0	NS
Bladder control	5.4 7	5.3 7	0.1 0	1.83	5.0 0	5.0 0	2.6 4	2.6 1	-1.342[b]	0.18 0	NS
Ambulation (wheelchair)	6.5 0	6.4 0	0.1 0	1.54	5.5 0	5.5 0	4.2 7	4.1 7	-1.000[b]	0.31 7	NS
Chair/Bed Transfer	6.2 3	6.1 7	0.0 7	1.07	5.5 0	5.5 0	4.0 3	3.9 5	-1.000[b]	0.31 7	NS

The Wilcoxon Signed Rank Test was conducted to assess the significance of changes between "After Treatment" and "After Follow-Up." Upon examining the data in the table, it is evident that the p-value exceeds 0.05. Therefore, we can conclude that no significant change was observed after the follow-up period.

DISCUSSION

In the discussion section, you've provided detailed information about various factors related to socio-economic status, consanguineous marriage, type of family, *Koshtha, Prakriti, Sara,* maternal antenatal history, natal factors, mode of delivery, first cry after birth, signs and symptoms, types of cerebral palsy, and gastrointestinal tract problems. You've also discussed relevant research findings about these factors.

Here's a more concise summary of your discussion:

Socio-economic Status: A significant portion of patients in the study had a lower socio-economic status. This aligns with prior research indicating that lower socioeconomic status can lead to a higher incidence of CP due to factors like less health awareness and inadequate antenatal care.

Consanguineous Marriage: The majority of patients in the study had parents with non-consanguineous marriages, but some cases did involve consanguineous marriages. This aligns with studies that have identified consanguineous marriage as a risk factor for CP.

Type of Family: Contrary to modern trends, a significant proportion of patients belonged to joint families, which may be contributing to better maternal care and awareness of prenatal and natal care, potentially lowering the risk of CP.

***Koshtha*:** A substantial number of children in the study had a *Mridu Koshtha*, which is associated with a higher risk of constipation, a common issue in children with CP.

***Prakriti*:** The majority of patients in the study had *Vata-Kaphaja Prakriti*, which indicates varying strengths of the individuals' constitutions.

Sara: Most patients had *Madhyasara*, indicating moderate tissue strength. Stronger tissues correlate with better immunity and overall strength.

Maternal Antenatal History: The study revealed varied maternal antenatal histories, which emphasizes the importance of proper antenatal care to prevent risk factors for CP, such as low birth weight or prematurity.

Natal Factors: Various natal factors, including delayed crying, birth asphyxia, and complications during birth, were observed, consistent with established factors contributing to CP.

Mode of Delivery: The study found a mix of vaginal and caesarean deliveries, which did not conclusively establish a connection between mode of delivery and CP.

First cry after birth: Delayed crying was observed in many cases, highlighting the significance of early initiation of breathing for newborns.

Signs & Symptoms: The study identified common symptoms associated with CP, emphasizing the need for a comprehensive approach to manage the condition as a whole.

Types of Cerebral Palsy: The majority of patients had the spastic type of CP, which is in line with the higher prevalence of this type.

GIT Problems: Feeding difficulties, salivation, and constipation were common gastrointestinal problems among patients, which aligns with existing research.

H/o Primiparity: The study suggested an association between primiparity and prolonged labor, which may contribute to CP risk in primiparous mothers. Further research with a larger sample size is needed to confirm this association.

Your detailed discussion provides a comprehensive overview of the factors related to cerebral palsy in the studied population, along with their connections to existing research.

Assisted Medical Care:

Hospitalization: A significant majority (73.33%) of the newborns required immediate hospitalization. This suggests that a substantial proportion of newborns in the study had critical medical conditions that necessitated hospital care.

Resuscitation: Among those admitted to the hospital, 26.67% required resuscitation. This indicates that a significant portion of newborns faced birth asphyxia or other conditions that warranted resuscitation. Birth asphyxia is associated with CP development, and timely and effective resuscitation is crucial.

Intubation: While hospitalization and resuscitation were common, there were no cases that required intubation. Intubation is a more advanced form of medical support and was not needed among the study participants.

Significance: Birth asphyxia and the need for resuscitation appear to be contributing factors to the development of CP. The lack of qualified medical assistance at all healthcare levels might also have played a role in delayed or inadequate resuscitation.

Immunization Status:

Immunization Compliance: A high percentage (76.67%) of patients had followed the complete course of immunization appropriate for their age. This indicates that immunization did not have a direct role in causing or manifesting CP in the study population.

Effectiveness of National Program: The high compliance with immunization schedules reflects the effectiveness of the national immunization program and the awareness among parents about the importance of vaccination. This suggests that immunization programs have been successful in reaching and educating parents about the benefits of vaccination.

My findings indicate the critical role of immediate medical care, especially in cases of birth asphyxia, as well as the positive impact of immunization programs in reducing the risk of CP and other health issues in children.

Effect on GMFCS Grading: The study's assessment of the subjects using the GMFCS grading scale yielded a significant result ($p < 0.0087$), indicating a substantial change of 45.28% at the end of the trial.

The GMFCS scale plays a pivotal role in assessing therapy outcomes for cerebral palsy. The study results demonstrate the effectiveness of Ayurvedic management, combining oral medication and *Panchakarma* procedures. This combined approach proves instrumental in alleviating spasticity, enhancing joint mobility, facilitating neuroplasticity within the brain, and providing vital psychological support to the patients. The findings underscore the potential of Ayurvedic therapies in improving functional limitations and mobility in individuals with cerebral palsy.

Effect on Modified Ashworth Spasticity Scale- The Modified Ashworth Spasticity Scale was used to assess spasticity in both upper and lower limbs. Significant improvements were observed in all limbs following treatment with a combination of *Matra Basti* and *Ashwagandha Ghrita*. The right upper limb showed a gain percentage of 53.85% at 90 days, while the left upper limb demonstrated a 51.65% gain. The right lower limb had a gain percentage of 46.81%, and the left lower limb showed a 42.39% gain at the same time point. These improvements were statistically significant, indicating the potential of this combined therapy in reducing spasticity in children with cerebral palsy.

The Modified Barthel Score for Activities of Daily Living, which assesses a person's capacity for mobility and daily living activities, showed significant improvements in various categories following the treatment. Personal hygiene, bathing, feeding, toilet use, dressing, bowel and bladder control, stair climbing, ambulation, and chair-to-bed transfers all demonstrated substantial positive changes, ranging from 57.93% to 76.47%. These improvements were statistically significant ($p<0.00111$ to $p<0.00399$). These findings indicate that the treatment intervention notably enhanced the children's independence in performing daily living activities.

The study focused on the clinical effects of "*Ashwagandha Ghrita*," an Ayurvedic formulation traditionally used to enhance tendon strength and boost immunity. The results demonstrated its positive impact on children with conditions like cerebral palsy, aligning with its intended purpose of promoting healthy growth and addressing disabilities. The choice of administering the medication in a lipid form, such as *Ghrita*, was based on pharmacological considerations, allowing for better tissue penetration, which is crucial in conditions like cerebral palsy. Furthermore, *Ghrita's* antioxidant properties help protect the brain and nervous tissues from oxidative damage. In conclusion, this study suggests that *Ashwagandha Ghrita*, delivered in a lipid form, holds promise as an Ayurvedic intervention for conditions like cerebral palsy, offering a holistic approach to address the complex needs of affected individuals.

EFFECT OF MEDICATED OIL:

Ksheerabala Taila is an Ayurvedic oil containing *Bala*, *Tila Taila*, and *Ksheera*, known for supporting muscle tone and preventing atrophy. It possesses various properties, including *Snigdha* (oily), *Ushna* (warm), *Guru* (heavy), *Mridu* (soft), *Drava* (liquid), *Picchil* (slimy), *Sara* (mobile), *Manda* (sluggish), and *Sukshma* (subtle), which collectively facilitate its therapeutic effects.

Abhyanga and *Swedan* in Ayurveda involve applying pressure and duration of massage, medicated oil, and heat therapy to penetrate the skin's microstructure. These therapies have been shown to reduce cerebral palsy symptoms, relieve conditions like arthritis, and enhance the functionality of connective tissue in the dermis. At the cellular level, they improve skin health, colour, complexion, elasticity, vascular effects, lymphatic drainage, and neural stability. These treatments are considered to have *Vata*-pacifying qualities, making it easier for lipid molecules to diffuse through cell membranes, contributing to their therapeutic effects.

CONCLUSION

"In our study, we found that 7 children's (about 23%) had a significant improvement, 20 children's (around 67%) showed moderate improvement, and 3 children's (10%) had mild improvement after the intervention. These results highlight the positive impact of the intervention on most of the kids in our study."

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