Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.69980/yxc45828

TO EVALUATE THE ADD-ON EFFECT OF SAMVARDHANA GHRITA FOR SPEECH AND LANGUAGE DEVELOPMENT IN CEREBRAL PALSY CHILDREN

Meena M. K.[1*], B.Mukhopadhyay [2] ,Singh B.M.[3]

[1*] Assistant professor, Department of Kaumarbhritya/Balroga; Govt Ayurveda College, Bharatpur, 321001; Rajasthan. India
[2] Professor Department of Shalakya Tantra, FOAy; IMS, Banaras Hindu University, Varanasi-221005; India.
[3] Professor Department of Kaumaryabhritya/Balaroga, FOAy; IMS, Banaras Hindu University, Varanasi-221005; India.

***Corresponding author:** Meena M. K
E-mail:drmukeshmeenabhu@gmail.com. Mobile. Number: 8318540284.

Abstract
Cerebral palsy is defined as a non-progressive disorder of cerebral origin in children, and many cases are associated with speech and language developmental delay. In Ayurveda, CP may be correlated to Shiromarmabhighata Vikara and offers various Bal Panchkrama interventions and herbal formulations, among which Samvardhana Ghrita is one of the indicated for enhancing speech and language milestones in children.
Objective: To evaluate the add-on effect of Samvardhana Ghrita for Speech and Language Development in Cerebral Palsy Children.
Methods: The clinical study was carried out in the Department of Kaumarabhritya, Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University. Twenty-four children who have cerebral palsy with delayed speech, aged1-16 years, randomly allocated into two groups(n=12) were enrolled. Group-1 received Samvardhana Ghrita along with Bal-Panchkarma therapy and Pratisarana of Vacha root for 45 days, while Group-2 received only Bal-Panchkarma therapy and Pratisarana with Vacha root without Samvardhana Ghrita for the same period. Follow-up assessments were done on the 30th and 45th days in both groups.
Result: Improvement was observed in both groups; however, Group 1 showed greater improvement than Group 2, with mean speech/language milestone scores of 39.33 ± 39.25 and 21.33 ± 24.86, respectively.
Conclusion: The addition of Samvardhana Ghrita to Bal-Panchkarma therapy may accelerate speech/language developmental milestones in children.

Keywords: Cerebral palsy, Samvardhana Ghrita, Speech, Bal-Panchkarma.

Introduction
Cerebral Palsy is a non-progressive neuromotor disorder of cerebral origin [1] but often presents as a changing motor impairment syndrome secondary to lesions or anomalies of the brain arising in the early stages of development [2], as brain development continues during the first years of life. It results from damage to the motor control centres of the developing brain. It can occur during the antenatal

period (about 75 per cent), during childbirth (about 5 per cent), or after birth (about 15 per cent), up to the age of 3 years. [3] The Worldwide incidence of cerebral palsy is 2 to 2.5/1000 live births [4], while in India, it is 3.8% of the population [5], including 25 lakhs CP children.[6] The incidence is higher in males than in females; a report by the Surveillance of Cerebral Palsy in Europe (SCPE) reports an M: F ratio of 1.33:1.[7]CP is a multifactorial disease of the developing brain and can be correlated with Shiromarmabhighata Vikara in Ayurveda based on its aetiology, clinical features, and classification of cerebral palsy. The term Shiromarmabhighata describes injury to the developing brain in utero, during delivery, or after birth, which may manifest in any of the following forms, or in mixed forms. Ardita (facial paralysis), Chakshu Vibhram (squint/nystagmus), Manyastambha (Neck rigidity), Udveshtana (body spasm or tonic spasm), Chestanasha (Loss of motor activities including limbs), Mukta (dumbness), Gadgadatva (speech defect), Lalasarva (excessive salivation, i.e., drooling), Swarhani (loss of speech), Vadan jihatva (facial spasm). [8] Shiromarmabhighata is a Vatavikara or Vata Vyadhi, so we treated it with the line of treatment for Vata Vikara. The study drug, Samvardhan ghrita, has been described by Acharya Kashyap under the Lehana (electuaries), and is commonly used to treat delayed milestones such as Pangu (lame) and Muka (Inability to speak) disorders. [9]

Materials and Methods

Study Design and Setting: A randomised comparative clinical study was conducted in the Department of Kaumarabhritya, IMS, BHU, Varanasi. The Institutional Ethics Committee of BHU approved the study protocol (Approval No. Dean/2014-15/EC/671; dated 24 June 2014). Written informed consent/ascent was obtained from the parents or legal guardians of all participants before enrolment.Participants: 24 children diagnosed with cerebral palsy, presenting with delayed speech/language developmental milestones, were registered. Inclusion Criteria: - A confirmed diagnosis of CP in children aged 1–16 years presenting with delayed speech and language milestones based on history and/or clinical evidence suggestive of prenatal, perinatal, or postnatal risk factors.Exclusion Criteria: -Children with Age below 1 year and more than 16 years, i.e. congenital anomalies, e.g., cleft palate, macroglossia, hearing impairment, ASD/ADHD, Metabolic or genetic disorders. Randomisation and intervention: The registered patients were randomly assigned to 2 groups, each comprising 12 children (n=12). Group A: Patients received Bal-Panchakarma therapy, including Abhyanga, Shirodhara, Shashtishali Pinda Swedana, and Avagaha (medicated tub bath), Pratisarana of Vacha-mula (Acorus calamus Linn.) along with Samvardhana Ghrita for 45 days.Group B: Patients received the Bal-Panchkarma therapy and Vacha-mula Pratisarana without Samvardhana Ghrita for 45 days.

Preparation and Administration of Samvardhan Ghrita:Samvardhana Ghrita was prepared according to the classical formulation described in the Kashyapa Samhita, using the Ghrita Paka Vidhi method.[10]

Table No. 01: Samvardhana Ghrita, following ingredients are [11]:

Sr. No.	Ingredients	Latin Name	Part used	Qty.
1	Khadria	Acacia catechu Willd.	Heart wood	1/7
2	Prishniparni	Uraria picta Jacq.	Whole plant	1/7
3	Syandana	Ougeinia dalbergioides Benth.	Stem Bark	1/7
4	Bala	Sida Cordifolia	Whole plant	1/7
5	Atibala	.Abutilon indicum Linn.	Whole palt	1/7
6	Kebuka	Costus peciosus	Rhizome	1/7
7	Saindhav	Sodium Chloride	-	1/7
8	Kshira	Milk	-	1
9	Ghee	Ghrita	-	1/2
10	Jala	Water	-	4

The dose of Samvardhana Ghrita was calculated as described in the Sharangadhara Samhita [12], after converting traditional units to metric equivalents. It was adjusted according to the child's age, as shown in Table 02 below.

Table No. 02: Dose of Samradhana Ghrita as per Age group:

Age (Years)	Samvardhan Ghrita
1-4	2.5g twice a day
5-8 (Years*)	3.5 g twice a day
9-12 (Years*)	4.5 g twice a day
13-16	5.5 g twice a day
Dosage form	Ghrita
Route	Oral (After meal)
Anupana	Ushanajala
Duration	45 days

Administration of Vacha-mula: For both groups, Acorus calamus Linn (Vacha) root was triturated in 5 mL of cow's milk by rubbing 40-50 times on a stone slab, along with one soaked almond, and mixed with 2-3 mL of honey before oral administration as Pratisaarana.

Outcomes: The primary outcome was observed improvement in speech and language developmental milestones

Statistical Analysis: The data were analysed using SPSS. The continuous variables were expressed as mean ± standard deviation, while within-group and between-group comparisons were performed using parametric or non-parametric tests based on the data distribution. Data were analysed using SPSS. The continuous variables were expressed as mean ± standard deviation (SD). Within-group and between-group comparisons were performed using parametric or non-parametric tests based on data distribution.

Table no-03: Maximum Time Limit (in weeks) for normal speech development and Language Development score[13] -

Weeks	Normal Speech Development	Language Development Score in weeks.
8	Smile and vocalisation when to talk	8
12	Sequel of pleasure	12
16	Laugh loudly to talk	16
20	Razzing Aa-goo	20
28	Speaking monosyllables: Ba, Da, Pa, Ma.	28
32	Speaking bi-syllable	32
48	One word with meaning	48
52	Two-to three-word phrases with meaning	52
72	Jargoning several intelligible words	72
82	Jargoning many intelligible words	82
104	Ask for a drink or food. Repeat things says Makes a sentence	104
156	Constantly asking questions uses pronouns.	156
208	Talk story in flow	208

1. Within this time limit, a delay in achieving Language/speech was considered a developmental delay.
2. Score, equal to the maximum time limit for achieving particular normal speech/language development, was given for the ease of calculation.

Investigations: CT scan, MRI, and EEG were performed to identify structural or neurological abnormalities in the brain regions.

Intervention Procedures

All registered patients received a Bal-Panchkarma regimen by trained therapists in the Bal-Panchkarma unit. The intervention protocol consisted of Shirodhara, Sarvanga Snehana, Shashtishali Pinda Swedana, Avagaha Sweda, and Shiropichu.

PROCEDURES: In the present study, Cerebral palsy is correlated to Shiromarmabhighata Vikara, so the line of treatment adopted is according to Vatika disorders. The following procedures were done in treating patients of both groups:

a.Shirodhara: It is a type of Murdha taila (Application of oil over the head/ scalp) according to Acharya Vagbhata [14]. For the Shirodhara procedure, the Shirodhara yantra, filled with 250 ml of each of the Jyotishmati, Mahanarayana, and Bala oils (500 ml), was drizzled from a height of ~10 to 12 cm. [15] Over the forehead & Murdha region for about 10-15 minutes initially than increased the duration of Shirodhara up to 20-30 minutes/ day for a total period of 21 days.

b.Sarvanga Snehana: Sarvanga Snehana with Maha Narayana oil mixed with an equal amount of Bala oil was done in Anuloma [16]. This was carried out for 10-15 minutes.

c.Shashti shali pinda swedan: After Sarvanga Snehana of the patients, SSPS (Shashti shali pinda swedan) was done for 10 minutes in circular motion.

d.Avgahana: After SSPS, Avgahana was given a minimum of 10-15 minutes, keeping in mind Desha, Kala, Bala, Vaya, Agni and Satmyata, etc. [17] for CP patients. The Droni (tub) filled with lukewarm Nirgundi-Rasnasaptaka-Dashmula decoction up to 6 Angula above the umbilicus [18] to keep the lower body part submerged. Finally, the body of the CP child was wiped off with a cotton towel.

e.Shiropichu: After the end of all the above procedures, the lukewarm Jyotishmati and Mahanarayana oil-dipped gauze piece, covered by Eranda patra, was kept over the Murdha (Anterior fontanel area) of the CP children of both groups, with a gently tight bandage for 2-3 hours.
f.Treatment duration: -The Bal-Panchakarma interventions were given for 21 consecutive days in both groups, while Samvaradhana Ghrita was given to only Group I for a total duration of 45 days.

Table No. 04: - Baseline characteristics of enrolled participants:-

Characteristic	Category	n (%)
Sex	Male	17 (70.83)
	Female	7 (29.17)
Gestational Age	Preterm	13 (54.17)
	Term	11 (45.83)
Birth Weight	>2.5 kg	11 (45.83)
	1.5–2.5 kg	11 (45.83)
	<1.5 kg	2 (8.33)
Perinatal Asphyxia	Present	17 (70.83)
Mode of Delivery	LSCS	21 (87.50)
	Vaginal Delivery	3(12.50)
Socioeconomic Status	Lower middle class	10 (41.67)
Neuroimaging Findings	PVL	13 (54.17)

OBSERVATION AND RESULT: A total of 24 patients were registered in the present study.
1). Age: 29.17% and 41.67% cerebral palsy cases having body weight < 80% and > 80%, respectively, were found in the less than 5-year age group, while in the more than 5-year age group, this was 12.50% and 16.67%. Further, the group-wise distribution of patients is shown in Table No. 5.

Table No. 05: Distribution of cerebral palsy cases (n=24) in accordance with age and weight, at registration

Age	Group-1 (n=12)		Group-2 (n=12)		Total (n=24)	
	Weight (< 80)	Weight (>80)	Weight (< 80)	Weight (> 80)	<80%	>80%
< 5Year	2 (16.66)*	7 (58.37)	5 (41.67)	3 (25.00)	7 (29.17)	10(41.67)
>5 Year	2 (16.67)	1 (8.33)	1 (8.33)	3 (25.00)	3 (12.50)	4 (16.67)
Total	4 (33.33)	8 (66.67)	6 (50.00)	6 (50.00)	10 (41.67)	14 (58.33)
	12 (100)		12 (100)		24 (100.00)	

Table no. 06: Mean of speech/language milestones at different levels irrespective of age (n=24).

Group	Mean of the actual age of registered children (weeks)	Mean age for normal speech milestones* of all registered children (A)	Mean age of achieved speech milestones, at registration, by all registered children (B) (R)	The mean age of speech milestones lagged behind the expected age of children at registration. (A-B)	Mean of speech milestones after treatment on the 1st follow-up (Response achieved within 3 weeks (F1)	Mean of speech milestones after treatment on 2nd follow-up (Response achieved within 6 weeks) (F2)	Mean of speech milestones acceleration after the treatment within 6 weeks (R-F2)
Group-1 (n=12)	206.58 ±12.37	179.83** ± 64.13	40.00 ±36.70	140.83 ±36.70	56.00 ±39.00	79.33 ±57.28	39.33 ±39.25
Group -2 (n=12)	193.67 ±191.61	157.33 ± 82.68	26.00 ±5.53	131.33 ±80.35	32.33 ±10.16	52.00 ±39.45	21.33 ±24.86

* The maximum age for the speech milestone is 5 years. It was considered in older children, i.e. age > 5 years, as the maximum age for the speech milestone is five years. ** The given data is in weeks.

Table no-07: Mean of speech/language mile stones at <5 year of age in registered case (n=30)

Group	Mean of the actual age of registered children (weeks)	Mean age for normal speech milestones* of all registered children (A)	Mean age of achieved speech milestones, at registration, by all registered children (B) (R)	The mean age of speech milestones lagged behind the expected age of children at registration. (A-B)	Mean of speech milestones after treatment on the 1st follow-up (Response achieved within 3 weeks (F1)	Mean of speech milestones after treatment on the 2nd follow-up (Response achieved within 6 weeks) (F2)	Mean of speech milestones acceleration after the treatment within 6 weeks (R-F2)
Group-1 (n=09)	151.22 ±44.93	151.22 ±44.93	29.78 ±4.05	127.78 ±46.49	48.89 ±26.06	67.56 ±43.92	37.78 ±42.10
Group-2 (n=08)	106.00 ±41.32	106.00 ±41.32	24.50 ±4.99	81.50 ±40.19	30.00 ±10.02	40.00 ±27.04	15.500 ±23.56

* The maximum age for the speech milestone is 5 years. It was considered in older children, i.e. age > 5 years, as the maximum age for the speech milestone is five years. ** The given data is in weeks.

Table no. 08: Mean of speech/language milestones at >5 years of age in registered cases (n=18)

Group	Mean of the actual age of registered children (weeks)	Mean age for normal speech milestones * of all registered children (A)	Mean age of achieved speech milestones, at registration, by all registered children (B) (R)	The mean age of speech milestones lagged behind the expected age of children at registration. (A-B)	Mean of speech milestones after treatment on the 1st follow-up (Response achieved within 3 weeks (F1)	Mean of speech milestones after treatment on the 2nd follow-up (Response achieved within 6 weeks) (F2)	Mean of speech milestones acceleration after the treatment within 6 weeks (R-F2)
Group-1 (n=03)	372.67 ±128.55	260.00	70.67 ±73.90	189.33 ±73.90	77.33 ±68.86	114.67 ±88.48	44.00 ±36.66
Group -2 (n=04)	390.00 ±226.66	260.00	29.00 ±6.00	231.00 ±6.00	37.00 ±10.00	76.00 ±53.36	34.00 ±25.81

* The maximum age for the speech milestone is 5 years. It was considered in older children, i.e. age > 5 years, as the maximum age for the speech milestone is five years. ** The given data is in weeks.

Discussion

The present study evaluated the effect of Samvardhana Ghrita as an adjunct to Bal-Panchakarma therapy on speech and language developmental delay in children with cerebral palsy of both groups were assessed after 45 days of therapy, and was observed that's, in group-I, actual mean age of all cerebral palsy children i.e. 206.58±12.37 weeks was observed with mean age of achieved language (speech) mile stones 40.00 ± 36.70 weeks instead of 179.83±64.13 weeks expected normal language mile stones age, at the time of registration. In group II, the actual mean age of all children with cerebral palsy was 193.67±191.61 weeks. In contrast, the mean age at which language milestones were achieved was 26.00±5.53 weeks, compared with the expected age of normal language milestones at registration, 131.33±80.35 weeks.

Overall change (mean difference) in speech milestones was observed as 39.33 ± 39.25 and 21.33 ± 24.86 weeks in group I and II, on follow-up II, respectively. (Table no. 06)

The results obtained from data on the effect of different therapies on speech/language developmental delay in CP children were divided into two groups: less than [Table no.07] and more than 5 years of age [Table no.08]. This categorisation was based on the fact that the major period of brain growth in normal children occurs up to age 5 years. At this age, speech is much more mature, and language is essentially completed in structure and form. [19]

Actual mean age of cerebral palsy children in less than 5 years of age group i.e. 151.22 ± 44.93, 106.00 ± 41.32, weeks was observed with mean age of achieved language (speech) mile stones 29.78±4.05, 24.50 ± 4.99, weeks instead of 151.22±44.93, 106.00 ± 41.32, weeks for expected normal language mile stones age, at the time of registration in group-I and II respectively (table no. 06). Overall change (mean difference) in speech mile stones was observed as 37.78±42.10 and 15.50 ± 23.56 weeks in group-I and II on follow ups –II, respectively. (Table no. 07).

Actual mean age of all cerebral palsy children in more than 5 years of age group i.e. 372.67 ±128.55 and 390.00 ± 226.66, weeks was observed with mean age of achieved language (speech) mile stones 70.67±73.90 and 29.00 ± 6.00 weeks instead of 260.00±0.00 and 260.00 ± 0.00 weeks expected normal language mile stones age, at the time of registration in group-I and II respectively (table no. 09). Overall change of mean difference in speech/language milestones observed as 44.00± 36.66 and 34.00 ± 25.82 weeks, in group-I and II respectively. (Table no.08)

The effect on achieving early catch-up of language milestones is good in both groups. Still, in group I, there is a relatively better response (Mean of Speech/language milestone: 39.33±39.25), while in group II (21.33±24.86), irrespective of age subdivision.

This better response to Samvardhana Ghrita with Bal-Panchakarma therapy was probably due to Samyoga Prabhava, i.e., enhanced action due to the combination of various herbomineral drugs, and the Yogavahi properties of butter oil.[20]

Mode of action of therapies: Cerebral palsy may be correlated with Shiromarmabhighata janiya Vata Vikara in the Ayurvedic context, so we treated it with the line of treatment for Vata Vikara. The Bal-Panchkarma therapy, including procedures such as Snehana (~ oleation) - Abhyanga, Shirodhara/Shiropichu, sudation with Shashtishali Pinda Svedana, Avagahana (tub bath with decoction), and Shashthikashali Pinda Svedana, was also carried out.

Probable mode of action of Shirodhara and Abhyanga: Skin is considered the main unit of Vata Dosha, along with Pakvashaya. [21] As Abhyanga (Snehana) and Shashtikashali Pinda Sveda involve cutaneous manipulation, they are considered among the prime procedures for mitigating Vata Dosha. [22-23] 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. It is considered that Shirodhara and Abhyanga also positively affect language development by enhancing sensory and motor responses, as the Sneha (oil) used has properties opposite to those of Vata Dosha. In the present study, Mahanarayana oil, Bala oil, and Jyotishmati oil were used for Shirodhara and Abhyanga in registered patients, containing lipophilic and hydrophilic active principles of Vatavyadhinashaka (Vata-normalising) ingredients that may modulate the secretion of various neurotransmitters.

Shashtika Shali Pinda Sweda: Cerebral palsy is a multifactorial disease, and most patients suffer from spasticity and joint deformities, i.e. contracture, scissoring, so in the present study, we also treated all patients with Shashtika Shali Pinda Sweda for the prevention and treatment of spasticity as well as joint contracture. Swedana Karama is sthambhagna, Sandhichestakar, Srotoshuddhikar, Kaphavata Nirodhana. [24] For treating Vatika Vikara, the preparation of SSPS by bolus of boiled Shashtika Shali (Oryza Sativa Linn) with milk and Dashamula Kwatha as its Kapha-Pitta-Vatahara properties, [25] while the reason for the use of Rasanasaptaka kwatha was its indication (pain in lumbosacral region), parshwa (pain in lateral side of vertebral column)-prishtha (backache)-uru-peeda (pain in thigh region) and ability to alleviate Saptadhatugata-vata (normalise the functions of Vayu in all the tissues of body). [26]

Probable mode of action of Samvardhana Ghrita: Samvardhana Ghrita is probably having such properties mentioned by Acharya Kashyapa for the treatment of Pangu (Lame), Muka (Dumb), Ashruti (Deaf) and Jada (Mentally deficient / Imbecile) child. [27] Most of the drugs in Samvardhana Ghrita have Madhura, Tikta Rasa, Guru Guna, Shita Virya and Madhura Vipaka. Medhya, drugs like Bala, Atibala, Mandukparni, Ghrita and Kshira are indicated for improving higher brain functions like Medha (Intellectual) and Rasayana. [28] The indication of Sanvardhana Ghrita for Vaka, Medha, Smruti, and Buddhi enhancement shows its efficacy in targeting motor, sensory, and higher functions.

Probable mode of action of Vacha Mula: The root of Vacha was given with honey to the patients of both groups, as the use of honey with an Ayurvedic medicine can enhance the potency and palatability of the drug and reduce its bitterness. [29] Previous studies have shown that the properties of the root of Acorus calamus improve learning performance by decreasing brain lipid peroxide content [30], and that it also improves grasping power, memory, intellect, and speech (language milestones).[31]

CONCLUSION: Cerebral palsy is a multifactorial neurological disorder; based on its aetiology, clinical features, and classification, it is correlated with Vata-vikara resulting from Shiromarmabhighata in Ayurveda. Overall, the findings suggest that the addition of Samvardhana Ghrita to Bal-Panchkarma therapy may yield greater improvements in speech and language developmental milestones among children diagnosed with cerebral palsy compared with Bal-Panchkarma therapy alone. Despite encouraging findings, the study has certain limitations, i.e., a relatively small sample size and a short follow-up period. There is a need for future multicentric randomised controlled trials with larger sample sizes and longer follow-up periods.

References

1. Paul VK, Bagga A. Ghai Essential Paediatrics. 7th ed. New Delhi: CBS Publisher& Distributors; 2014.p.559.
2. Parthasarathy A, Menon PSN, Gupta P, MKC, editors. IAP Testbook of Paediatrics. 4th ed. Vol. 2. New Delhi: Jaypee Brothers Medical Publishers;2009. p.1045.
3. Rathia S, Kori VK, Rajagopala S, Patel KS. Management of cerebral palsy with Samvardhana Ghrita and cretin Ayurvedic procedures: a clinical study. Int J Ayur Res.2016;2(9):1202-1209.
4. Right diagnosis.com. Cerebral palsy statistics by country [Internet]. Health Grades Inc.;2011 [updated 2009 Apr 15; cited 2013 Jan 22.]. Available from: http://www.rightdiagnosis.com/c/cerebral palsy/stats-country.htm Rightdiagnosis.com.
5. Kurubar AD, Munnoli BT, Vijaykumar D, Arbar A, Patil A. Role of Matra Basti (enema) over Abhyanga (massage) and Sweda (Sudation) in reducing spasticity in cerebral palsy with Shuddha Bala Taila: a randomised comparative clinical study.Int J Ayur Pharma Res.2014;2(2):47-52.
6. Anjaiah B. Clinical Paediatrics. 3rd ed. Hyderabad: Paras Medical publisher;2006. p.231.
7. Johnson A. Prevalence and characteristics of children with cerebral palsy in Europe. Dev Med Child Neurol. 2002; 44:633-640.
8. Sharma RK, Das B. Charka Samhita. Vol-2, Varanasi: Chaukhamba Sanskrit Series office;2008. Siddhi Sthana, Chapter 9, verse 6.
9. Sharma HP. Kashyapa, Varanasi: Chaukhambha Sanskrit Sansthan;2015. p.6.
10. Tripathi B. Sharngadhara Samhita. Varanasi: Chaukhamba Sanskrit Prakashan; 2006. P. 218.
11. Sharma HP. Kashyapa Samhita. Varanasi: Chaukhambha Sanskrit Sansthan;2015. P.6.
12. Tripathi B. Sharngadhara Samhita. Varanasi: Chaukhamba Sanskrit Prakashan; 2006. P. 84.
13. Gupta P, editor. Clinical Methods in Pediatrics. 3rd ed. New Delhi: CBS Publishers & Distributors; 2014. p.110-114.
14. Murthy KRS. Ashtanga Hridayam 10th ed. Varanasi: Chaukhambha Krishnadas Academy; 2014.p.273.
15. Lavekar GS. A Practical Handbook of Panchkarama Procedures. New Delhi: Central Council for Research in Ayurvedic Sciences, 2009. p.64.
16. Kasture SD. Ayurvediya Panchkarma Vigyanam. Nagpur; Shri Baidyanath Ayurveda Bhavan Ltd.;2011. p.83.
17. Sharma RK, Das B. Charaka Samhita Varanasi: Chaukhambha Sanskrit Series;2015. p.287.
18. Sitaram B, Chunekar KC. Bhavaprakasha of Bhavamishra. 1st ed. Varanasi: Chaukhambha Orientalia;2006. p. 646.
19. Gupat P, editor. Clinical methods in Paediatrics. 3rd ed. New Delhi: CBS Publishers&Distributors; 2014.p.117.
20. Sharma RK, Das B. Charaka Samhita. Varanasi; Chaukhambha Sanskrit Series;2015. p.247.
21. Vaghata. Asthanga Sangraha Sutra Sthana, Doshabhediya Adhyaya20/1. Murthy KRS, translator. Vol. 1, 3rd ed. Varanasi; Chaukhambha Orientalia;2004. p.367.
22. Vagbhata. Asthanga Sangraha Sutra Sthana, Dinacharya Adhyaya 2/8. Murthy KRS, translator. Vol-1. Reprinted. Varanasi: Chaukhambha Krishnadas Academy;2012. p.24.
23. Vagbhata. Asthanga Sangraha Sutra Sthana, Swedavidhi Adhyaya 17/25. Murthy KRS, translator. Vol-1,3rd ed. Varanasi: Chaukhambha Orientalia; 2004.p.223-224.

24. Kurubar AD, Munnoli BT, Vijaykumar D, Arbar A, Patil A. Role of Matra basti (enemia) over Abhyanga (massage) and Sweda (sudation) in reducing spasticity in cerebral palsy with shuddha Bala Taila: a randomised comparative clinical study. Int J Ayur Pharma Res. 2014;2(2):47-52.
25. Murthy KRS. Sushruta Samhita. Varanasi; Chaukhambha Orientalia;2014. p.274.
26. Tripathi B. Sharngadhara Samhita. Varanasi: Chaukhamba Sanskrit Prakshan;2006. p.146.
27. Sharma HP.Kashyapa Samhita. Varanasi: Chaukhamba Sanskrit Sansthan;2015. P 6.
28. Rathia S. Kori VK, Rajagopala S, Patel KS, Chaudhary SA. A clinical study to assess the effect of Samvardhana Ghrita and Yoga Basti in cerebral palsy. Int J Pharm Sci. 2015;6(4); Oct-Dec.
29. Gupta P, Tripathi A, Agrawal T, Narayan C, Singh BM, Kumar M, et al. Synergistic experimental biology. Exp Biol. 2016; 54:530-536.
30. Manikandan S, Srikuamr R, Jeya Parthasarathy N, Sheela Devi R. Protective effect of Acorus calamus Linn. On free radical scavengers and lipid peroxidation in discrete regions of the brain against noise stress-exposed rats. Biol Pharm Bull. 2005:28:2327-2330.
31. Vohora SB, Shah SA, Dandiya PC. Central nervous system studies on an ethanol extract of Acorus calamus rhizomes. J Ethnopharmacol. 1990;28:53-62.