



DEVELOPMENTAL DELAY IN CHILDREN: A COMPREHENSIVE REVIEW AND INTEGRATIVE MANAGEMENT APPROACHES

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ABSTRACT Developmental delay in children represents a significant global health concern, encompassing deficits in motor, language, cognitive, social, and adaptive domains. Early identification and intervention are essential to mitigate long-term disability and improve functional outcomes. This review aims to evaluate the types of developmental delays, their epidemiological distribution, underlying aetiologies, and current management strategies, including both modern medical and Ayurvedic approaches. A systematic literature review was conducted using databases such as PubMed, Scopus, Web of Science, and Google Scholar, focusing on studies published between 2000 and 2025, along with classical Ayurvedic texts. Evidence indicates that global developmental delay affects approximately 1–3% of children under five years, while specific delays such as speech and language delay are the most prevalent, affecting 5–10% of preschool children. Multifactorial aetiologies include genetic, perinatal, environmental, and socio-cultural factors. Modern management emphasizes early intervention programs, behavioural therapies, and pharmacological support in selected cases. Ayurvedic perspectives conceptualize developmental delay under Manas Vikara and related disorders, emphasizing Dosha imbalance, Dhatu kshaya, and impaired Manovaha srotas. Interventions such as Medhya Rasayana, Panchakarma, and neurodevelopmental supportive therapies are described. Integrative approaches may offer holistic benefits, though robust clinical evidence remains limited. Further interdisciplinary research is necessary to establish standardized integrative protocols.

KEYWORDS : Developmental Delay, Global Developmental Delay, Speech Delay, Paediatric Neurodevelopment, Ayurveda, Medhya Rasayana, Early Intervention

1. INTRODUCTION

Developmental delay refers to the failure of a child to achieve age-appropriate milestones in one or more developmental domains. These domains include gross motor, fine motor, speech and language, cognitive, and social-emotional skills [1]. The burden of developmental disorders has increased globally due to improved survival of preterm infants and heightened diagnostic awareness [2] [3].

Despite advances in paediatric neurology, gaps persist in early detection, accessibility of interventions, and culturally adaptable management strategies. In many regions, particularly in low- and middle-income countries, delayed diagnosis remains a major challenge [4].

Aim and Objectives:

- To classify types of developmental delays
- To analyse prevalence and most common types
- To critically evaluate modern and Ayurvedic management approaches

2. Methodology of Literature Review

3. Historical Perspective / Conceptual Background

Early descriptions of developmental disorders emerged in paediatric neurology during the 20th century, with classification systems evolving alongside advances in neuroimaging and genetics [5].

In Ayurveda, developmental abnormalities are attributed to imbalances in Vata Dosha, defective Beeja (genetic factors), and improper maternal regimen (Garbhini Paricharya) [6].

4. Review of Literature

4.1 Types of Developmental Delays

Developmental delay is categorized into:

1. Gross Motor Delay – delayed sitting, standing, walking
2. Fine Motor Delay – difficulty in grasping, coordination
3. Speech and Language Delay – impaired communication
4. Cognitive Delay – intellectual impairment
5. Social/Emotional Delay – poor interaction
6. Global Developmental Delay (GDD) – delay in ≥ 2 domains [7]

4.2 Most Common Developmental Delay and Prevalence

- Speech and language delay is the most common and its Prevalence

is 5–10% in preschool children [8]

- **Global Developmental Delay (GDD):** Prevalence: 1–3% of children under 5 years [9]
- **Autism Spectrum Disorder-related Delays:** Approx. 1 in 36 children [10]

Samprapti of Umnada and its Conceptual Correlation with Autism Spectrum Disorder

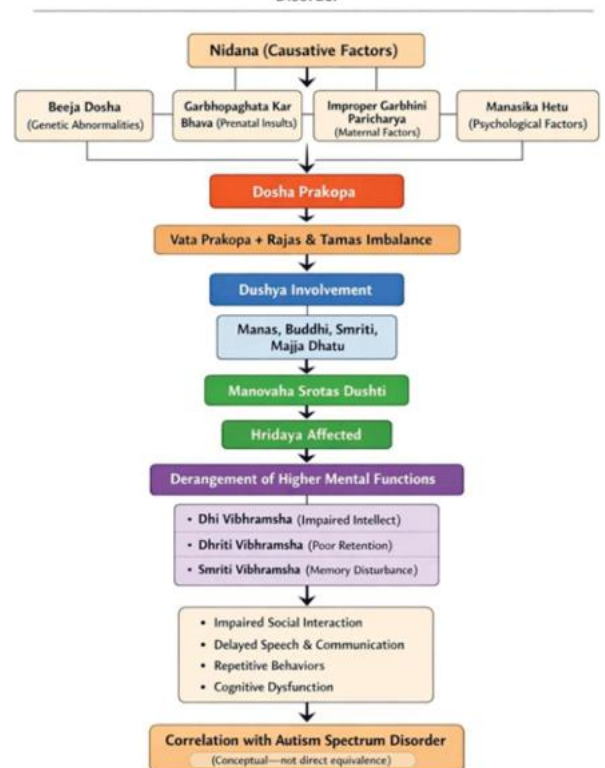


Fig 1: Samprapti:

From an Ayurvedic perspective, certain behavioural and cognitive abnormalities observed in Autism Spectrum Disorder may be correlated with features of Unmada, particularly involving disturbances in Dhee, Dhriti, and Smriti, though direct equivalence is not implied [11,12].

The Samprapti (pathogenesis) of Unmada involves vitiation of Doshas—predominantly Vata, along with Rajas and Tamas affecting the Manovaha Srotas [13,14].

The aggravated Doshas, in association with impaired Dhee (intellect), Dhriti (retention), and Smriti (memory), lead to derangement of higher mental functions. Additionally, involvement of Hridaya (seat of consciousness) and Majja Dhatu contributes to altered cognition, behavior, and social interaction [15].

Factors such as Beeja dosha (genetic defects), Garbhopaghata kara bhava (intrauterine insults), and improper maternal regimen further contribute to the manifestation of such conditions. This multi-factorial Samprapti aligns with the modern understanding of neurodevelopmental disruptions in Autism Spectrum Disorder [16,17].

Motor Delays: Around 2–5% prevalence [18]

Speech delay predominates due to environmental and neurodevelopmental influences, including reduced stimulation and increased screen exposure [19].

4.3 Pathophysiology / Mechanism

Developmental delay arises from disruptions in brain maturation involving:

- Synaptogenesis abnormalities
- Neurotransmitter imbalance
- White matter injury (especially in prematurity)
- Genetic mutations affecting neuronal development [20]

Ayurvedic Understanding of Pathophysiology

Ayurvedic understanding attributes developmental delay to disturbances in Dosha, Dhatu, and Srotas, primarily involving Vata, Majja Dhatu, and Manovaha Srotas.

1. Vata Dushti Affecting Neural Functioning

Vata Dosha, being responsible for all neurological and motor activities, plays a central role in neurodevelopment. Its subtypes contribute specifically:

- Prana Vayu Dushti governs higher mental functions, sensory perception (Indriya), and cognition. Its vitiation leads to impaired attention, poor sensory integration, and defective cognitive processing [21].
- Udana Vayu Dushti is responsible for speech and expression (Vak Pravritti). Its disturbance results in speech delay and impaired communication [22].
- Vyana Vayu Dushti controls motor coordination and neuromuscular activity. Vitiation leads to delayed motor milestones and poor coordination [23].
- Samana Vayu Dushti regulates digestion and nutrient assimilation. Its impairment results in inadequate nourishment of Dhatus, indirectly affecting brain development [24].

Thus, Vata Dushti, especially involving Prana and Udana Vayu, directly correlates with deficits in cognition, behavior, and communication seen in developmental delay.

2. Majja Dhatu Kshaya (Depletion of Nervous Tissue)

Majja Dhatu is responsible for nourishment and functioning of the nervous system.

- Its depletion leads to impaired neuronal functioning, cognitive deficits, and memory disturbances [25].
- It affects Buddhi (intellect), Smriti (memory), and emotional stability.

This aligns with modern concepts of neurodevelopmental dysfunction.

3. Impaired Manovaha Srotas

Manovaha Srotas are responsible for mental and psychological functioning.

- Their vitiation results in disturbances of Manas, emotional instability, and impaired social interaction [26].
- Involvement of Rajas and Tamas leads to behavioral abnormalities such as hyperactivity, irritability, withdrawal, and poor responsiveness [27].
- Dysfunction of Hridaya (seat of consciousness) contributes to

impaired cognition and behavior [28].

Integrated Ayurvedic Interpretation

The combined effect of Vata Dushti, Majja Dhatu Kshaya, and Manovaha Srotas Dushti leads to derangement of Dhi, Dhriti, and Smriti, resulting in clinical manifestations such as speech delay, cognitive impairment, and social dysfunction [29].

4.4 Ayurvedic Correlation of Aetiology [30]

Ayurveda explains the causation of developmental delay through disturbances occurring during Beeja, Garbha avastha, and postnatal life. The modern risk factors can be correlated as follows:

Prenatal Factors

- **Genetic Disorders** → Beeja, Beeja Bhaga, Beeja Bhaga Avayava Dushti [31,32]

Genetic abnormalities can be understood as defects in Beeja (ovum/sperm), Beeja Bhaga (chromosomal components), and Beeja Bhaga Avayava (gene-level structures), leading to improper fetal development and congenital anomalies. These defects result in abnormal formation of organs, including the nervous system.

- **Maternal Infections** → Garbhopadrava / Garbhopaghata Kara Bhava [33,34]

Infections during pregnancy act as Garbhopadrava (complications affecting fetus) and may disturb fetal growth and development. They vitiate Doshas in the uterine environment, leading to impaired neurodevelopment.

- **Maternal Malnutrition** → Garbhini Poshana Vaishamya [35,36]

Inadequate maternal nutrition leads to improper nourishment of the fetus (Rasa–Rakta Dhatu kshaya), resulting in poor development of Majja Dhatu and the nervous system.

Perinatal Factors

- Birth asphyxia → Prana Vayu Dushti / Oja Kshaya
Hypoxic injury during birth can be correlated with vitiation of Prana Vayu, affecting vital functions and higher mental control, along with depletion of Ojas, leading to long-term neurological impairment.
- Prematurity → Apakva Garbha / Alpabala Garbha
Preterm birth represents incomplete maturation of fetal organs (Apakva Avastha), resulting in underdeveloped Dhatus, especially Majja Dhatu, predisposing to developmental delay.
- Low birth weight → Alpaposhya / Dhatu Kshaya
Low birth weight indicates inadequate intrauterine nourishment, leading to Dhatu alpata (tissue deficiency) apra vikruti (Placental abnormalities) and impaired neurodevelopment.

Postnatal Factors

- CNS infections → Mastishka Abhigata / Krimi / Jwara Janya Dushti/ Sutika Roga
Postnatal infections affecting the brain can be understood as Krimi (microbial invasion) or Jwara affecting Majja Dhatu and Manovaha Srotas, leading to cognitive and neurological deficits.
- Malnutrition → Balashosha / Karshya
Chronic undernutrition results in Balashosha (wasting in children), leading to deficient development of Dhatus, particularly Majja, affecting cognition and growth.
- Environmental deprivation → Manasika Hetu / Asatmya Indriyartha Samyoga

Lack of stimulation, emotional neglect, and poor environmental interaction can be correlated with Manasika Nidana and improper sensory engagement, affecting mental and social development.

Integrated Ayurvedic Perspective

Disturbances Occurring at the Level of:

- Beeja (genetic factors)
- Garbha poshana (fetal nutrition)
- Garbhopaghata kara bhava (intrauterine insults) lead to improper development of Dhatus, particularly Majja, and vitiation of Vata Dosha, ultimately manifesting as developmental delay.

4.5 Diagnostic Approaches

Modern tools include:

- Developmental screening (Denver II, ASQ)
- Neuroimaging (MRI)
- Genetic testing
- Hearing and vision assessment [37]

Ayurvedic diagnosis relies on:

- Clinical observation (Darshana)
- Assessment of Dosha and Dhatu status [38]

4.6 Management Approaches

Modern Pharmacological Management

There is no single drug for developmental delay itself; medications are prescribed for associated conditions such as ADHD, epilepsy, autism-related irritability, and nutritional deficiencies.

Ayurvedic Management

In Ayurveda, drug action depends on Rasa, Guna, Virya, Vipaka, and Prabhava, acting on Manas, Majja Dhatu, and Manovaha Srotas. The commonly used Medhya drugs exhibit the following pharmacological properties:

Table 1: Drug Details

Drug Name	Properties	Clinical Relevance
Brahmi (Bacopa monnieri) [39]	Tiktā–Kashaya Rasa, Laghu Guna, Sheeta Virya, Medhya Rasayana; acts on Manas and enhances Dhi, Smriti, and Medha. Pharmacological actions include nootropic, neuroprotective, antioxidant, and cholinergic modulatory effects.	Improves cognition, attention, memory, and learning ability in children with developmental delay.
Shankhapushpi (Convolvulus pluricaulis) [40]	Medhya, Nidrajanana, Manas Shamak. Exhibits anxiolytic, sedative, nootropic, and neuroprotective activities.	Useful in hyperactivity, anxiety, poor concentration, and behavioral disturbances.
Mandukaparni (Centella asiatica) [41]	Medhya Rasayana, Tridosha Shamak (especially Vata-Pitta). Enhances neuronal dendritic growth and possesses neuroprotective and antioxidant properties.	Supports cognitive enhancement, memory improvement, and neurodevelopment.

Table 2: Panchakarma Procedure and Details

Panchakarma Procedure	Ayurvedic Mechanism	Functional Effects	Modern Correlation	Procedure Details
Abhyanga (Therapeutic Oil Massage) [48,49]	Pacifies Vata Dosha (primary Dosha involved in neurological functions); enhances Dhatu Poshana through improved circulation; strengthens Mamsa and Majja Dhatu.	Improves neuromuscular coordination; promotes sensory integration (Indriya Samyak Yoga); enhances growth and development.	Improves peripheral circulation and lymphatic flow; stimulates mechanoreceptors aiding neurodevelopment; reduces stress hormones.	Oil: Bala Taila / Ksheerabala Taila Duration: 20–30 minutes daily or alternate days
Shirodhara [50]	Acts on Manovaha Srotas and Hridaya (seat of consciousness); reduces Rajas and Tamas; stabilizes Prana Vayu.	Improves attention, sleep, and behavior; reduces irritability and hyperactivity.	Modulates hypothalamic–pituitary–adrenal (HPA) axis; induces relaxation response and parasympathetic dominance.	Oil: Brahmi Taila / Jatamansi Taila etc. Duration: 20–30 minutes/session Course: 7–14 days
Nasya (Nasal Drug Administration) [51]	“Nasa hi Shiraso Dwaram” -nose is the gateway to the brain; directly acts on Shiras i.e. on Prana Vayu, Indriya, and Manovaha Srotas; nourishes Majja Dhatu.	Enhances cognition, memory, and speech; improves sensory and motor coordination.	Facilitates drug delivery to CNS via olfactory pathway; enhances neurochemical modulation.	Oil/Ghrita: Anu Taila / Brahmi Ghrita / Ksheerabala (101) / Kalyanaka Ghrita / Goghrita etc. Dose: 1-2 drops per nostril Duration: 7–14 days
Basti (Medicated Enema) [52,53]	Considered the best therapy for Vata Dosha (Ardha Chikitsa); regulates systemic Vata and nourishes Dhatus; acts on Pakvashaya, the main seat of Vata i.e. Samana Vayu; enhances Agni, improves nourishment and ultimately brain nourishment.	Improves motor function and coordination; enhances overall growth and neurological development.	Gut–brain axis modulation; improves absorption and systemic metabolic regulation.	Dose: 20–50 ml in children depending on age Note: Done under strict supervision; considered comparatively safe among Panchakarma procedures in children.

In cases of speech delay, the following Ayurvedic interventions are specifically employed:

- Jivha Nirlekhana (tongue scraping/stimulation therapy) using Vachadi Churna and Akkalkara Churna
- Viddha Karma (therapeutic puncturing procedure)
- Kavala and Gandusha Karma (therapeutic gargling and oral retention procedures)

Comparative Analysis

Modern medicine focuses on targeted neurodevelopmental rehabilitation, supported by strong empirical evidence. Ayurvedic therapies offer a systemic and preventive approach, emphasizing neuro-nutrition and holistic balance.

Yashtimadhu (Glycyrrhiza glabra) [42]	Madhura Rasa, Guru-Snigdha Guna, Medhya, Balya. Demonstrates neuroprotective, anti-inflammatory, and memory-enhancing effects.	Supports cognitive function and reduces neuroinflammation associated with neurodevelopmental disorders.
Ashwagandha (Withania somnifera) [43,44]	Balya, Rasayana, Medhya, Vatahara. Possesses adaptogenic, neuroregenerative, and GABA-mimetic activities.	Improves cognition, reduces stress, enhances neurological strength, and supports overall development.

Compound Formulations

Brahmi Ghrita [45]

- **Pharmacological Actions:**
 - o Lipid-mediated drug delivery to CNS (Ghrita as Yogavahi)
 - o Enhances memory and learning
- **Clinical Relevance:** Cognitive delay, speech delay

Kalyanaka Ghrita [46]

- **Pharmacological Actions:**
 - o Tridosha balancing, especially Vata-Pitta Shamak
 - o Improves mental functions.
- **Clinical Relevance:** Neurodevelopmental and psychiatric conditions

Saraswatarishta [47]

- **Pharmacological Actions:**
 - o CNS stimulant and cognitive enhancer
 - o Improves speech and memory
- **Clinical Relevance:** Speech delay, learning disorders

Role of Panchakarma in Developmental Delay

Panchakarma therapies act through Dosha Shamana, Srotoshodhana, and Dhatu Poshana, particularly targeting Vata Dosha, Majja Dhatu, and Manovaha Srotas.

However, limitations in Ayurvedic research include small sample sizes and lack of randomized controlled trials. Integrative models combining both systems may provide enhanced outcomes but require validation [54].

Other Integrative therapies: Speech therapy, occupational therapy, Yoga, Pranayam and Genetic Counselling.

4. Research Gaps and Limitations

- Limited high-quality randomized trials in integrative medicine
- Variability in diagnostic criteria across studies [55]

5. Future Perspectives

- Development of integrative clinical guidelines
- Use of neuroimaging to evaluate Ayurvedic interventions
- Large-scale RCTs evaluating Medhya Rasayana [56]

6. CONCLUSION

Developmental delay in children is a multifactorial condition requiring early identification and multidisciplinary management. Speech and language delay remains the most prevalent form. While modern medicine provides structured and evidence-based interventions, Ayurveda offers complementary approaches targeting systemic balance and cognitive enhancement. Integration of both systems holds promise, but requires rigorous scientific validation to ensure safety, efficacy, and reproducibility.

7. REFERENCES

- Shevell M, et al. Practice parameter: evaluation of developmental delay. *Neurology*. 2003;60(3):367–380.
- Olusanya BO, et al. Global burden of developmental disabilities. *Lancet Glob Health*. 2018;6(10):e1100–e1121.
- Black MM, et al. Early childhood development. *Lancet*. 2017;389(10064):77–90.
- Gladstone M, et al. Child development in LMICs. *Pediatrics*. 2012;130(5):e1323–e1330.
- Rutter M. Developmental psychiatry concepts. *J Child Psychol Psychiatry*. 2011;52(4):368–382.
- Agnivesha. *Charaka Samhita, Sharirasthana, Chapter 8, Chaukhamba*; 2014. p. 345–350.
- American Psychiatric Association. *DSM-5*. 5th ed. 2013.
- Law J, et al. Prevalence of speech delay. *Int J Lang Commun Disord*. 2000;35(2):165–188.
- van Kamebeek CDM, et al. GDD prevalence. *Dev Med Child Neurol*. 2005;47(5):299–304.
- CDC. Autism prevalence report. 2023.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Nidanasthana, Unmada Nidana, Chapter 7, Verse 4–10*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 222–226.
- Sharma PV. *Ayurveda and Mind: Concepts of Manas in Ayurveda*. Reprint ed. Varanasi: Chaukhamba Orientalia; 2013. p. 45–60.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Chikitsasthana, Unmada Chikitsa, Chapter 9 (or 28 depending on edition), Verse 5–12*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 30–40.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sutrasthana, Chapter 1, Verse 57–58 (Rajas–Tamas as Manasika Dosha)*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 24–26.
- Sushruta. *Sushruta Samhita, Sharirasthana, Chapter 4 (Dhatu Vibhaga Sharira)*, Verse 30–35. In: Srikantha Murthy KR, editor. Reprint ed. Varanasi: Chaukhamba Orientalia; 2015. p. 72–75.
- Tiwari PV. *Ayurvediya Prasuti Tantra Evam Stri Roga*. Vol. 1. Reprint ed. Varanasi: Chaukhamba Orientalia; 2019. p. 120–145.
- Thapar A, Cooper M, Rutter M. Neurodevelopmental disorders. *Lancet Psychiatry*. 2017;4(4):339–346.
- Spittle AJ, et al. Motor delay in infants. *Pediatrics*. 2009;123(3):e512–e520.
- Madigan S, et al. Screen time and development. *JAMA Pediatr*. 2019;173(3):244–250.
- Volpe JJ. *Neurology of the newborn*. 6th ed. Elsevier; 2018.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sutrasthana, Vata Vyadhi Adhyaya, Chapter 12, Verse 8–10*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 240–245.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Chikitsasthana, Unmada Chikitsa, Chapter 28, Verse 3–5*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 52–55.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sutrasthana, Vata Vyadhi Adhyaya, Chapter 12, Verse 8–10*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 240–245.
- Vagbhata. *Ashtanga Hridaya, Sutrasthana, Dosha Bheda Adhyaya, Chapter 12, Verse 1–10*. In: Srikantha Murthy KR, editor. Reprint ed. Varanasi: Chaukhamba Krishnadas Academy; 2016. p. 167–172.
- Sushruta. *Sushruta Samhita, Sharirasthana, Dhatu Vibhaga Sharira, Chapter 4, Verse 30–35*. In: Srikantha Murthy KR, editor. Reprint ed. Varanasi: Chaukhamba Orientalia; 2015. p. 72–75.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Vimanasthana, Srotovimana Adhyaya, Chapter 5, Verse 3*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 251–253.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sutrasthana, Dirghanjivitiya Adhyaya, Chapter 1, Verse 57–58*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 24–26.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sutrasthana, Vata Vyadhi Adhyaya, Chapter 12, Verse 8–10*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 240–245.
- Sharma PV. *Ayurveda and Mind: Concepts of Manas in Ayurveda*. Reprint ed. Varanasi: Chaukhamba Orientalia; 2013. p. 45–60.
- Tiwari PV. *Ayurvediya Prasuti Tantra Evam Stri Roga*. Vol. 1. Reprint ed. Varanasi: Chaukhamba Orientalia; 2019. p. 120–145.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sharirasthana, Katidhapurusha Sharira, Chapter 4, Verse 30–35*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 412–418.
- Tewari PV. *Ayurvediya Prasuti Tantra Evam Stri Roga*. Vol. 1. Reprint ed. Varanasi: Chaukhamba Orientalia; 2019. p. 120–128.
- Sushruta. *Sushruta Samhita, Sharirasthana, Garbhavyakarana Sharira, Chapter 2, Verse 46–50*. In: Srikantha Murthy KR, editor. Reprint ed. Varanasi: Chaukhamba Orientalia; 2015. p. 25–30.
- Tewari PV. *Ayurvediya Prasuti Tantra Evam Stri Roga*. Vol. 1. Reprint ed. Varanasi: Chaukhamba Orientalia; 2019. p. 210–218.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Sharirasthana, Jatisutriya Sharira, Chapter 8, Verse 20–25*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 452–458.
- Tewari PV. *Ayurvediya Prasuti Tantra Evam Stri Roga*. Vol. 1. Reprint ed. Varanasi: Chaukhamba Orientalia; 2019. p. 145–155.
- Glascow FP. Screening tools. *Pediatrics*. 2005;116(4):1012–1016.
- Sharma PV. *Ayurveda concepts of child development*. Chaukhamba; 2013.
- Singh RH. Exploring issues in the development of Ayurvedic research methodology. *Journal of Ayurveda and Integrative Medicine*. 2011;2(2):91–95.
- Nahata A, Patil UK, Dixit VK. Effect of *Convolvulus pluricaulis* on learning and memory in rodents. *Pharmaceutical Biology*. 2008;46(6):447–452.
- Orhan IE. *Centella asiatica* (L.) Urban: From traditional medicine to modern medicine with neuroprotective potential. *Phytotherapy Research*. 2012;26(6):933–940.
- Dhingra D, Sharma A. Antidepressant-like activity of *Glycyrrhiza glabra* L. in mice. *Journal of Ethnopharmacology*. 2008;116(2):377–380.
- Kulkarni SK, Dhir A. *Withania somnifera*: An Indian ginseng. *Indian Journal of Pharmacology*. 2008;40(4):147–154.
- Chandrasekhar K, Kapoor J, Anishetty S. A prospective, randomized double-blind, placebo-controlled study of safety and efficacy of a high-concentration full-spectrum extract of *Ashwagandha* root in reducing stress and anxiety. *Indian Journal of Psychological Medicine*. 2012;34(3):255–262.
- Sharma PV. *Dravyaguna Vijnana*. Vol. 2. Reprint ed. Varanasi: Chaukhamba Bharati Academy; 2013. p. 445–460.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Chikitsasthana, Unmada Chikitsa, Chapter 9 (or 28 depending on edition)*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 30–70.
- Government of India, Ministry of Health and Family Welfare. *The Ayurvedic Formulary of India*. Part I. 2nd ed. New Delhi: Department of AYUSH; 2003. p. 150–152.
- Singh OP, Mehta V. Role of Abhyanga in neurological disorders. *AYU (An International Quarterly Journal of Research in Ayurveda)*. 2012;33(1):55–60.
- Field T. Massage therapy research review. *Complementary Therapies in Clinical Practice*. 2014;20(4):224–229.
- Uebaba K, Xu FH, Tagawa M, et al. Using a healing touch technique (Shirodhara) to reduce stress. *Journal of Alternative and Complementary Medicine*. 2008;14(4):431–436.
- Sharma PV. *Charaka Samhita, Siddhasthana, Nasya Adhyaya*. Reprint ed. Varanasi: Chaukhamba Orientalia; 2014. p. 250–260.
- Agnivesha, Charaka, Dridhabala. *Charaka Samhita, Siddhasthana, Basti Adhyaya, Chapter 1*. In: Sharma RK, Dash B, editors. Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 680–700.
- Dash B, Sharma BK. *Charaka Samhita*. Vol. 5 (Siddhasthana). Reprint ed. Varanasi: Chaukhamba Sanskrit Series Office; 2014. p. 1–120.
- Patwardhan B, et al. Ayurveda and systems biology. *J Altern Complement Med*. 2015;21(9):547–552.
- Thapar A, et al. Developmental disorders research gaps. *Lancet Psychiatry*. 2017;4(4):339–346.
- Bhatt N, et al. Integrative pediatrics future. *J Integr Med*. 2020;18(2):90–97.