

SYSTEMATIC REVIEW



Clinical evidence on Ayurvedic Management of Attention-Deficit/Hyperactivity Disorder in children and adolescents: A systematic review



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ABSTRACT

Background: Attention-deficit/hyperactivity disorder (ADHD) is a common neurodevelopmental disorder characterized by inattention, hyperactivity, and impulsivity. Ayurveda proposes several therapeutic approaches, including *Medhya Rasayana* formulations and *Panchakarma* procedures, for managing ADHD symptoms. This systematic review evaluated the evidence on Ayurvedic management for ADHD in children and adolescents.

Method: A systematic review was conducted following PRISMA guidelines. Electronic databases were searched for studies published between January 2014 and June 2024. Clinical trials, observational studies, case series and open label studies involving Ayurvedic management in children and adolescents with ADHD were included, and methodological quality was assessed using the Jadad scale.

Results: Of 231 identified records, eight studies met the inclusion criteria. Interventions included *Bacopa monnieri*, *Withania somnifera*, *Saraswatarista*, *Brahmi Churna*, *Mandukaparni Churna*, and *Mentosoothe* formulations, *Mahapaishacika Ghrita*, and *Shirodhara*-based therapies. *Bacopa monnieri* improved attention, impulse control, and cognitive performance, with reductions in attention-deficit symptoms reported in up to 85% of children. *Saraswatarista* significantly improved scholastic performance and interpersonal relationships. *Brahmi Churna* and *Mandukaparni Churna* showed benefits in hyperactive-impulsive and inattentive symptoms, respectively, while *Withania somnifera* reduced anxiety and social concerns. Combined interventions, particularly *Vallarai Khiritha* with *Shirodhara*, demonstrated improvements in overall ADHD symptoms. However, methodological quality was limited, with five studies classified as high risk of bias, two as moderate risk, and only one as low risk.

Conclusion: Ayurvedic management show potential benefits in improving behavioural and cognitive symptoms of ADHD; however, larger, high-quality randomized controlled trials are required to establish their efficacy and safety.

Keywords: Adolescent; Ayurvedic Medicine; Child; Complementary Therapy; Plant Extracts; Phytotherapy

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INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental disorders in children, affecting academic performance, behaviour, and social functioning [1]. Global prevalence of ADHD in children and adolescents is approximately 7.6% (95% CI 6.1 – 9.4%) [2]. Although pharmacological therapies such as stimulants are widely used [3], concerns regarding long-term

safety, side effects, adherence, and variable treatment response in some children have led some parents and caregivers to explore complementary approaches, including Ayurveda, as adjuncts to standard care.

The diagnosis of ADHD is primarily standardized through two major classification systems: the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM) and the World Health Organization's International Classification of Diseases (ICD). While the DSM-IV-TR and DSM-5 define ADHD by a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development [4], the ICD-10 traditionally classified similar presentations as Hyperkinetic Disorders, requiring both inattention and hyperactivity to be present [5]. The ICD-11 has aligned more closely with the DSM-5 framework, acknowledging ADHD as a singular diagnostic entity with various presentations [6].

In Ayurveda, ADHD has no direct diagnostic equivalent; however, based on symptom similarity, it can be correlated with disturbances of the channels carrying the mind (*Manovaha Srotas*) and conditions such as mental derangement (*Unmada*) [7]. ADHD symptoms such as inattention, hyperactivity, and impulsivity can be interpreted through concepts such as disturbed mental control (*Mano Vibhrama*), impaired cognition and decision-making (*Buddhi Vibhrama*) and memory disturbances (*Smriti Vibhrama*). These manifestations are considered to arise from an imbalance of Vital Life Force (*Prana Vata*), mental and cognitive functions (*Sadhaka Pitta*), and nourishment and protection of nervous system (*Tarpaka Kapha*), along with disturbances of dynamic energy (*Raja Guna*) and inertial energy (*Tama Guna*). Therefore, Ayurvedic management focusing on brain tonics (*Medhya Rasayana*), purification therapies (*Panchakarma*), and lifestyle modifications may help improve the cognitive and behavioural symptoms associated with ADHD.

Ayurvedic management of ADHD includes avoidance of causative factors (*Nidana Parivarjana*), pharmacological and procedural interventions (*Yuktivyapashraya Chikitsa*), and psychological and behavioural approaches (*Satvavajaya Chikitsa*) [8]. Several *Medhya Rasayana* herbs, including *Bacopa monnieri* (*Brahmi*), *Withania somnifera* (*Ashwagandha*), *Mandukaparni*, and *Shankhapushpi*, are traditionally used to improve cognition, attention, memory, and behavioural regulation [9,10]. In ad-

dition, *Panchakarma* procedures and lifestyle management such as dietary regulation, yoga, and meditation have been advocated in managing ADHD symptoms.

Despite increasing interest in Ayurvedic management for ADHD, the available evidence remains fragmented and consists primarily of small clinical studies using heterogeneous interventions and outcome measures. To date, there has been limited synthesis of the clinical evidence regarding the effectiveness and methodological quality of Ayurvedic therapies for ADHD in children and adolescents. Therefore, this systematic review was conducted to evaluate clinical evidence on the effectiveness of Ayurvedic management for reducing ADHD symptoms in children and adolescents and to assess the methodological quality of the included studies using the Jadad scoring system.

METHODS

Study design

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. The review aimed to synthesize evidence regarding the effectiveness of Ayurvedic management in children and adolescents diagnosed with ADHD.

Search strategy

A comprehensive literature search was performed in Google Scholar, PubMed, ResearchGate, ScienceDirect, and the AYUSH Research Portal for studies published between January 2014 and June 2024. Search terms included combinations of Medical Subject Headings (MeSH) and free-text keywords such as "Attention Deficit Hyperactivity Disorder", "ADHD", "Ayurveda", "Ayurvedic management", "Children", and "Adolescent" using Boolean operators ("AND", "OR"). Reference lists of eligible studies were also manually screened to identify additional relevant publications.

Eligibility criteria

Research articles were selected under eligibility assessment based on the following criteria: children and adolescents (≤ 18 years) diagnosed with ADHD based on DSM-IV/DSM-5 or ICD diagnostic criteria; Ayurvedic management including internal medications (e.g., *Medhya Rasayana* formulations), *Panchakarma* therapies, and Ayurveda-based life-

style modifications; placebo, no intervention, conventional therapy, or other Ayurvedic management; and ADHD-related symptoms such as inattention, hyperactivity, impulsivity, behavioural changes, cognitive performance, scholastic outcomes, and validated rating scale outcomes (e.g., Conners' Rating Scale). The selection of articles for this systematic review is reported using PRISMA guidelines [11]. Selected articles included randomized controlled trials, non-randomized clinical trials, open-label studies, and case series.

Study selection

The inclusion criteria were as follows: clinical trials, observational studies (including randomized controlled trials, non-randomized clinical trials, open-label trials) evaluating Ayurvedic management of ADHD; participants with children/adolescents diagnosed with ADHD; studies published between January 2014 and June 2024; studies published in English; and full-text articles available.

The exclusion criteria were as follows: review articles, systematic reviews, meta-analyses, conceptual papers; case reports/single case studies (except case series if relevant); studies involving adults only; theses/dissertations not available as full-text published articles; and animal studies or in-vitro studies.

Data extraction and management

All records retrieved from databases were exported into Microsoft Excel. Duplicate records were identified and removed manually. Two reviewers independently screened titles and abstracts for eligibility. Full-text articles were then assessed independently by both reviewers. Any disagreements were resolved through discussion and mutual consensus.

Extracted information included author and year of publication, country, study design, sample size and participant characteristics, diagnostic criteria, type and duration of intervention, comparator, outcome measures, main findings and adverse events

Risk of bias assessment

Methodological quality was assessed using the Jadad scale, which evaluates randomization, blinding, and reporting of withdrawals and dropouts. Scores range from 0 – 5, with higher scores indicating superior methodological quality. Studies scoring 0 – 2 were considered high risk of bias, scores of 3 – 4 represented moderate risk, and scores of 5 indicated low

risk of bias. Assessment was conducted independently by two reviewers, and discrepancies were resolved by consensus [12].

Data analysis

Owing to substantial heterogeneity in interventions, outcome measures, and study designs, quantitative meta-analysis was not considered appropriate. Therefore, a qualitative synthesis was conducted by extracting and summarizing data from the included studies, including study design, sample size, participant characteristics, Ayurvedic management, treatment duration, outcome measures, and key findings. The studies were grouped according to the type of Ayurvedic intervention, such as *Medhya Rasayana* formulations, herbal extracts, and *Panchakarma* therapies, and their clinical outcomes were compared narratively.

RESULTS

Studies selected

The literature search identified 231 records from electronic databases. After removal of eight duplicate records, 223 studies underwent title and abstract screening. Of these, 109 full-text articles were assessed for eligibility, and 101 studies were excluded because they were review articles, conceptual papers, pilot studies, or non-clinical studies. Ultimately, eight studies met the eligibility criteria and were included in the qualitative synthesis. Among the included studies, three evaluated single herbal extracts, three investigated Ayurvedic compound formulations, one examined *Panchakarma*-based interventions, and one assessed combined Ayurvedic therapeutic approaches. The PRISMA flow diagram for the selection of studies is depicted in [Figure 1](#). The characteristics of the eight included studies are provided in [Table 1](#).

Characteristics of included studies

The eight included studies were published between 2014 and 2023 and were conducted in India (n = 5), Sri Lanka (n = 1), Australia (n = 1), and Iran (n = 1) as shown in [Table 1](#). Sample sizes ranged from 5 to 120 participants, with study durations varying from 30 days to 6 months. Six studies included only children, while two studies included both children and adolescents. ADHD diagnosis was primarily based on DSM-IV or DSM-5 criteria. Study designs included randomized controlled trials (n = 5), ran-

domized placebo-controlled studies (n = 2), one open-label trial, and one case series. Outcome measures varied considerably and included the Conners' Parent Rating Scale, DSM-based assessments, cognitive performance measures, scholastic performance indicators, and behavioural assessments.

Effects of Ayurvedic management

Bacopa monnieri demonstrated improvements in at-

tention, impulse control, restlessness, learning problems, and cognitive performance [15]. One study reported reductions in restlessness in 93% of participants, improvements in self-control in 89%, and reductions in attention-deficit symptoms in 85% of children [13]. *Saraswatarista* showed significant improvements in scholastic performance, participation in organized activities, reading ability, writing skills, and interpersonal relationships [16]. *Brahmi Chur-*

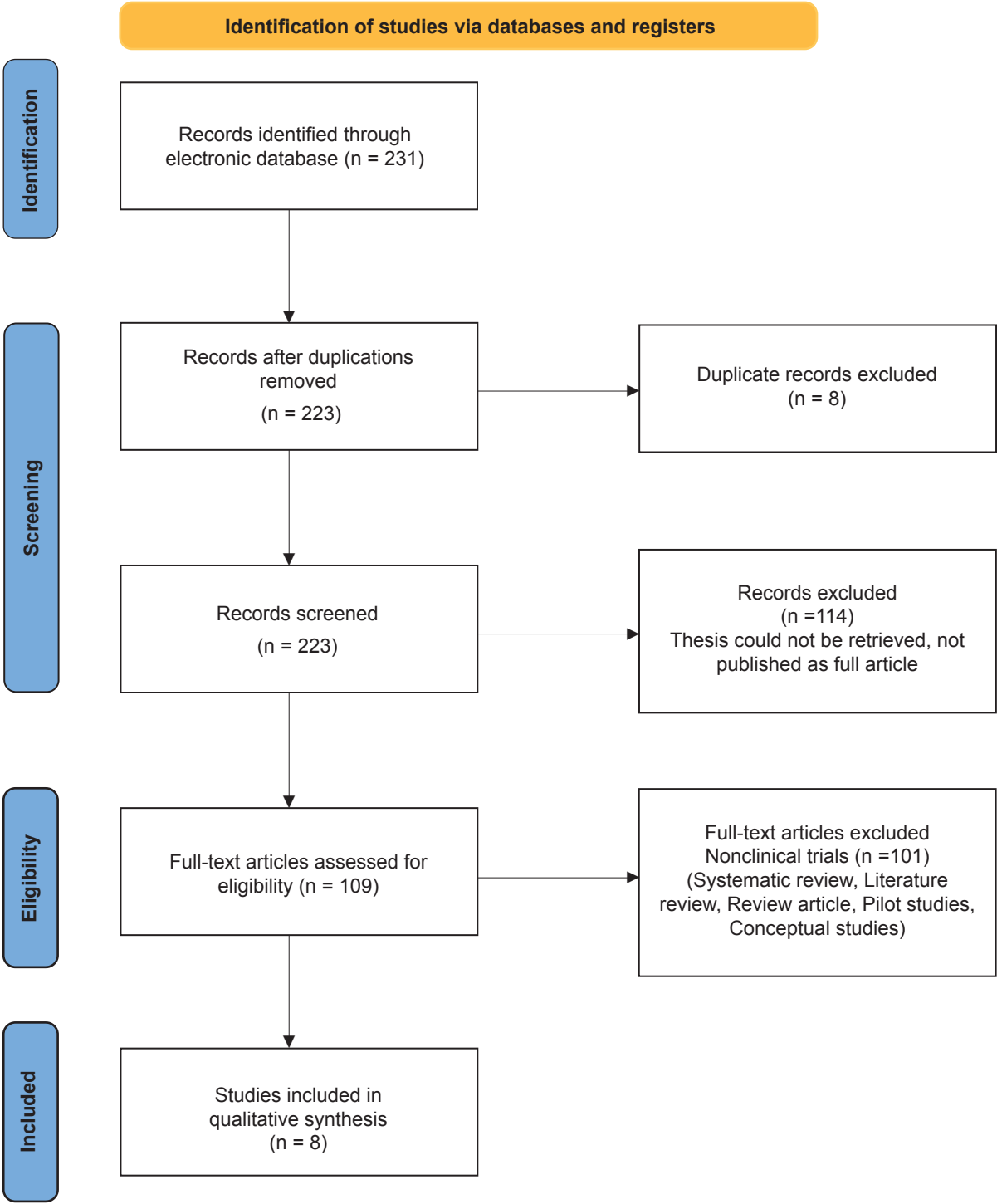


Figure 1. PRISMA flow diagram of study selection on the Ayurvedic management of attention-deficit/hyperactivity disorder in children and adolescents

Table 1. Characteristics of studies that reported on the Ayurvedic management of attention-deficit/hyperactivity disorder in children and adolescents

Author, year, country	Type of study design, study setting	Sample size	Intervention	Control	Follow up Duration	Method of Measurement	Results/Findings
Dave et al. 2014 India [13]	Open-labelled, Centre for Research in Mental Retardation (CREMERE), Mumbai	n = 31; aged 6 – 12 years	Standardized <i>Bacopa monnieri</i> extract at a dose of 225 mg/day	-	6 months	Dropouts = 4	Symptom scores for restlessness were reduced in 93% of children, improvement in self-control was observed in 89% of the children. The attention-deficit symptoms were reduced in 85% of children. Symptom scores for learning problems, impulsivity, and psychiatric problems were reduced in 78%, 67%, and 52% of children, respectively. Observed that 74% of the children exhibited up to a 20% reduction, while 26% of children showed between a 21% and a 50% reduction in the total subtests scores, except for social problems. Standardized extract of <i>Bacopa monnieri</i> was well tolerated by the children
Anpuchelvi et al. 2014 Sri Lanka [14]	Randomized Placebo, Hospital-based OPD study	n = 48; aged 6 – 15 years Group A; n = 12 Group B; n = 12 Group C; n = 12 Group D; n = 12	Group A: <i>Vallarai Khiritha</i> (200 mg/kg/day) in 2 divided doses Group B: <i>Vallarai Khiritha</i> + <i>Shirodhara</i> Group D: <i>Shirodhara</i>	Group C: placebo (Honey doses to that of study drugs)	3 months	Dropouts = 8	Both drug & Shirodhara were effective in alleviating the symptoms of ADHD
Kean et al. 2015, Australia [15]	Randomized, placebo-controlled, double-blind trial, Swinburne Centre for Human Psychopharmacology, Swinburne University Victoria	n = 120; male children aged 6 – 14 years	Visit 1, Week 0: placebo capsules for 7 days Visit 2, Week 1: CDR1o8 or placebo 14 weeks	-	16 weeks	20% dropout rate	Reduction of the level of hyperactivity and inattention measured by the Conners' Parent Rating Scale. Cognitive function, mood, sleep quality, and electroencephalographic parameters were assessed.

Author, year, country	Type of study design, study setting	Sample size	Intervention	Control	Follow up Duration	Method of Measurement	Results/Findings
			Visit 3 & 4: same outline of CDRIo8 or placebo till week 15				The results of the study suggest that Bacopa monnieri extract (CDRI o8) may improve brain and cognitive function.
			Visit 5, Week 16: placebo for 1 week (CDRIo8- Bacopa extract)				
Kumar et al. 2015, India [16]	Randomized, double blind, placebo-control Out-patient Department of PG Department of Gopabandhu Ayurveda Mahavidyalaya, Puri & Schools in Puri	n = 35; aged 7 – 13 years Diagnostic screening of children DSM-IV Criteria	Group A: n = 15; treated with Saraswatarista; 01 mL/kg/day two divided doses with equal amount of water	Group B: n = 15; given only placebo syrup	12 weeks	5 dropouts	Group A: Patients showed highly significant improvement in overall scholastic performance, participation in organized activities, writing skills, mathematical aptitude, and relationships with parents and siblings and reading ability. Group B: Changes were not statistically significant.
Deokar et al. 2023, India [17]	Randomized, open-labelled clinical trial study Out-patient Department and In-patient Department of Kaumarabhritya Department, Parul Institute of Ayurveda, Vadodara	n = 20 Diagnostic screening of children DSM-IV Criteria	Group A: n = 10; <i>Brahmi</i> Churna 3 g in 3 divided doses before meals, <i>anupana-madhu</i> Group B: n = 10; <i>Mandukaparni Churna</i> 3 g in 3 divided doses before meals, <i>anupana-madhu</i>	-	45 days	-	<i>Brahmi</i> had significant results on Inattention as well as Hyperactive-Impulsive type of (ADHD). <i>Mandukaparni</i> showed significant results on both criteria, especially in inattention type.

Author, year, country	Type of study design, study setting	Sample size	Intervention	Control	Follow up Duration	Method of Measurement	Results/Findings
Hosseini et al. 2017, Iran [18]	Randomized, double blind, placebo control Ibn Sina Hospital Mashhad	n = 31 Based on DSM-5 diagnostic criteria	Control group; n = 15; placebo Intervention group; n = 16; consumed 10 mg <i>Withania somnifera</i> once daily for 6 weeks.	-	6 weeks	6 dropouts	Reduced the symptoms of physiological anxiety, sensitivity, and social concerns.
Kumawat et al. 2023, India [19]	Randomized, double blind, comparative Out-patient Department and In-patient Department of balaroga/kaumarabrtya Department of N.I.A. Jaipur & Associated Hospital	n = 40 Based on DSM-5 criteria of diagnosis	Group A: n = 20; Mentosoothe compound A (<i>Tagar, Vacha, Brahmi, Ashwagandha, Trikatu</i>) dose - 250 mg BD, route - oral Group B: n = 20; Mentosoothe compound B (<i>Jat-amansi, Shankapushpi, Guduchi, Chitrak, Trikatu</i>) dose - 250 mg BD, route - oral	-	3 months (2 months clinical trial + 1 month post clinical period)	-	Reduced the symptoms of physiological anxiety, sensitivity, and social concerns. Both formulations showed clinically significant improvement, with comparative differences observed between groups.
Aboobacker et al. 2023, India [20]	Case series Five diagnosed cases of ADHD as per DSM-5 criteria Manassanthi Out-patient Department of VPSV Ayurveda College Kottakal	n = 5	Case 1: 6-year-old male Case 2: 8-year-old male Case 3: 9-year-old male Case 4: 7-year-old male Case 5: 7-year-old female Treated with <i>Mahapashacika Ghrta</i> , twice daily 1 h after food, with lukewarm water	-	30 days	-	36% relief on hyperactivity domain and 20% relief on inattention domain in the Conner's Revised Rating Scale after Ayurvedic management and follow up.

n = Number of the sample

na and *Mandukaparni Churna* demonstrated beneficial effects on hyperactive-impulsive and inattentive symptoms, respectively [17]. *Withania somnifera* reduced physiological anxiety and social concerns among children with ADHD [18]. Furthermore, combined interventions such as *Vallarai Khiritha* with *Shirodhara* and *Mentosoothe* formulations reported clinically significant improvements in overall ADHD symptomatology [14]. *Mahapaishacika Ghrta* demonstrated a 36% reduction in hyperactivity scores and a 20% reduction in inattention scores following treatment and follow-up [20].

No serious adverse events attributable to Ayurvedic management were reported in the included studies; however, adverse event reporting was inconsistent across studies.

Heterogeneity of outcome measures

Considerable heterogeneity was observed among the studies with respect to interventions, outcome mea-

asures, treatment durations, and study designs. Assessment tools included the Conners’ Parent Rating Scale, DSM-IV/5 criteria, scholastic performance indicators, cognitive assessments, and investigator-developed symptom scores. Due to this clinical and methodological heterogeneity, quantitative synthesis was not feasible.

Quality assessment of studies

The overall methodological quality of the included trials was predominantly low to moderate, with five of the eight studies (62.5%) being classified as having a high risk of bias, two studies (25.0%) demonstrating moderate risk, and only one study (12.5%) exhibiting a low risk of bias (Table 2).

DISCUSSION

This systematic review summarizes clinical evidence on Ayurvedic management for ADHD in children and adolescents. Synthesis of the included studies

Table 2. Jadad scores for assessing Risk of Bias in the included studies

Author, Year (Reference)	Random-ization	Double Blinding	Description of Randomization	Description of Double Blinding	Description of Withdrawal	Total Points	Risk of Bias Interpretation
Dave et al. 2014 India [13]	-	-	-	-	01 point	01 point	High Risk
Anpuchelvi et al. 2014 Sri Lanka [14]	01 point	-	-	-	01 point	02 points	High Risk
Kean et al. 2015, Australia [15]	01 point	01 point	01 point	01 point	01 point	05 points	Low Risk
Kumar et al. 2015, India [16]	01 point	01 point	-	-	01 point	03 points	Moderate Risk
Deokar et al. 2023, India [17]	01 point	-	01 point	-	-	02 points	High Risk
Hosseini et al. 2017, Iran [18]	01 point	01 point	-	-	01 point	03 points	Moderate Risk
Kumawat et al. 2023, India [19]	01 point	01 point	-	-	-	02 points	High Risk
Aboobacker et al. 2023, India [20]	-	-	-	-	-	00 points	High Risk

suggests that brain tonic (*Medhya Rasayana*) formulations and *Panchakarma*-based interventions may contribute to improvement in core symptoms of inattention, hyperactivity, and behavioural outcomes [14,16,18]. However, the overall evidence remains limited due to methodological weaknesses, including small sample sizes ($n < 50$), inadequate blinding, and limited use of placebo controls.

The use of *Bacopa monnieri* was evaluated across several trials for its effect on inattention and cognitive processing and studies reported that *Bacopa* is well-tolerated in children aged 6 – 12 years [15,17]. Clinical results using the (CDRI) 08 extract—a standardized *Bacopa* formulation—demonstrated reduced symptoms based on the Conners' Parent Rating Scale [21]. Similarly, *Saraswatarista* improved scholastic performance and interpersonal relationships using the Diagnostic and Statistical Manual of Mental Disorders [16]. While *Brahmi Churna* showed significance in hyperactive-impulsive symptoms, *Mandukaparni Churna* demonstrated a focus on inattention, though these findings are limited by small sample sizes and short durations of 45 days.

The clinical improvements observed across these studies are grounded in the distinct pharmacological and physiological effects of the interventions on the central nervous system. *Bacopa monnieri*, a primary *Medhya Rasayana*, have been shown to facilitate the repair of damaged neurons and promote synaptic activity [22]. This neurological restoration improves nerve impulse transmission, which is directly linked to increased attention span and memory retention in children with ADHD [15].

Interventions targeting the physiological stress response and impulsivity utilized herbs like *Withania somnifera* (*Ashwagandha*). *Ashwagandha* reduces physiological anxiety and social concerns as measured by DSM-5 criteria. *Ashwagandha* exerts a calming effect that helps mitigate the impulsivity and restlessness characteristic of ADHD [18]. *Mahapaishacika Ghrta*, containing *Nardostachys jatamansi* (*Jatamansi*) as a key ingredient, resulted in a 36% improvement in hyperactivity and 20% improvement in inattention [20].

The combination of internal medicine and external procedures showed a synergistic advantage in symptom management. The combination of *Vallarai Khiritha* and *Shirodhara*—an Ayurvedic therapy involving a steady, rhythmic stream of warm herbal oil poured onto the forehead, resulted in significant

improvements in the Intelligence Quotient (IQ), Coefficient of Division of Attention, and Reaction Time [14]. The therapeutic effect of *Shirodhara* is attributed to the induction of a parasympathetic state via continuous tactile stimulation of the forehead, which lowers autonomic arousal and improves self-control.

Considerable heterogeneity was observed among the included studies regarding study design, diagnostic criteria, interventions, outcome measures, and duration of follow-up. Such variability limited direct comparisons between studies and precluded quantitative meta-analysis. Furthermore, the use of non-standardized formulations and varying dosages poses challenges for establishing evidence-based treatment recommendations for their use in clinical settings. Therefore, these interventions should not currently be considered substitutes for established evidence-based treatments until further robust evidence becomes available.

Limitation

The findings of this review should be interpreted in light of several limitations. Challenges commonly arise when conducting systematic reviews in this field, including the limited availability of high-quality data, studies not being published as full articles, and a general scarcity of large-scale clinical trials. Furthermore, the individual studies included in this review often suffered from insufficient randomization and small sample size, a lack of robust control groups, and short duration of management. Future research should prioritize larger cohorts, randomized controlled designs, and longer duration of follow-up to validate these findings and establish standardized treatment protocols.

CONCLUSION

By conceptualizing the condition as an imbalance of the brain *doshas* and qualities of mind, *Medhya Rasayanas* like *Bacopa monnieri* and *Withania somnifera*, alongside procedural therapies such as *Shirodhara*, have demonstrated improvements in attention span, cognitive function, and the regulation of hyperactive-impulsive behaviours. However, the scientific validation of these findings is limited by methodological weaknesses, including small sample sizes, short study durations, and a lack of replicable evidence comparing standardized formulations against conventional treatments or placebos. The challenges

in standardizing traditional preparations, combined with the complexity of evaluating multi-modal Panchakarma therapies, underscore a critical gap in the current research framework.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare no competing interests.

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Declaration of Artificial Intelligence Use

AI-based tools are used only for minor language editing. All scientific content, data interpretation, and conclusions are the work of the authors.

Author contribution

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Conceptualization, Methodology, Validation, Formal analysis, Resources, Writing – review & editing, Supervision, Project administration: WASSW

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