Review Article

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A SYSTEMIC REVIEW ON THE MANAGEMENT OF ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN CHILDREN

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ABSTRACT

ADHD, a tantalising neurodevelopmental disorder documented in the DSM-5, fascinates with its distinctive characteristics: persistent inattention and hyperactivity. Beyond the surface, it intertwines with cognitive, social, and behavioural domains and affects 5.29% globally. Ayurvedic hints like Mano Vibhrama and Raja-Tama guna alignment illuminate a path, offering tridosha-shaman therapy, Medhya rasayana, and Panchakarma. A fusion of modern understanding and ancient wisdom paves the way for unravelling ADHD's enigma, promising novel solutions. This study aims to systematically review the management of attention deficit hyperactivity disorder in Ayurveda. To conduct this study, Ayurveda research articles were obtained from PubMed, Google Scholar and AYUSH portal. A total of 40 studies were obtained, which underwent further screening processes to achieve the quality of inclusion criteria. A total of 14 articles were selected from different publications of the review. Out of 14 articles obtained, 7 studies (n=14) exclusively focused on shaman chikitsa with different single drugs and various drug formulations, 06 studies (n=14) focused on shaman and Panchakarma therapy, which includes shirodhara, abhyanga, matra basti, kashaya basti and nasya, 1 study (n=14) emphasised the importance of Panchakarma. Out of 14 clinical studies, 6 showed highly significant results, 1 showed comparatively insignificant results, and 7 showed moderately significant results. This study combines Ayurvedic insights with modern ADHD research, providing a promising opportunity for integrative treatment approaches. Further investigation of this intersection could reveal new dimensions in the fight against this complex neurodevelopmental disorder.

Keywords: ADHD, Panchakarma, Systemic analysis

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most well-studied disorders and has baffled researchers, clinicians, and researchers. This neurodevelopmental disorder is described in the American Psychiatric Association (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and is characterised by a persistent pattern of inattention or hyperactivity/impulsivity. The effects of hyperactivity go beyond the surface and affect children and adolescents' social, cognitive, and behavioural development. This conflict is becoming more common and shows its importance in modern medicine. The global prevalence of ADHD affects approximately 5.29% of the population, indicating its importance. In India, prevalence ranges from 2% to 17%, with large regional variations[1]. A case in point is the 9.7% probability measure in Jaipur, which indicates a problem[2]. In particular, the prevalence of ADHD is age group and is estimated at 5-10% in children and 4-6% in adults[3]. Gender also plays an important role. Boys are two to four times more likely to have ADHD than girls.

Up to 12 years old at the time of onset, the child should have more than six symptoms of a certain type. The DSM-5 divides symptoms into two subtypes: inattentiveness and hyperactivity/impulsivity. While hyperactivity includes being on the go and fidgety, inattention includes careless blunders, not listening to instructions, easily being side-tracked, etc., while impulsivity comprises intrusive, interruptive conduct and the inability to wait for a turn. The aetiology of ADHD remains complex, with many factors contributing to its development. Genetic predisposition is an important factor, along with factors such as prolonged labour, allergies, and childbirth, as well as the mother's prenatal life. ADHD is often chronic, and most people affected by ADHD continue into adulthood. This expansion has many effects, both emotionally and physically. Complications of this disease include low self-esteem, depression, substance abuse, sleep problems, anxiety, autism spectrum disorders, and learning disabilities. As a result, ADHD has a substantial financial and emotional impact on individuals, families, and society as a whole. Medications are the mainstay of ADHD treatment, including prescription drugs such as amphetamine/methylphenidate and tricyclic antidepressants. However, these drugs are also associated with side effects such as insomnia, loss of appetite, and weight gain. The effectiveness of these recommended medications is often below expectations, which encourages the search for alternatives.

In recent years, there have been positive results in the field of Ayurveda in the investigation of ADHD. Although not directly applicable to ADHD, Ayurvedic principles suggest a connection between these disorders and concepts such as Unmada. In Ayurveda, there are no direct references to ADHD, but some references to abnormal behaviour are discussed under features of UNMADA- mano vibhrama, buddhi vibhrama, smriti vibhrama,

sheela vibhrama, cheshta vibrama, and achara vibhrama, and considering nature of symptomatologic manifestation, it can be correlated with Unmada. It is a Vata-Pitta pradhan sarva-dosha (sharirik+mansik) prakopak vyadhi. This is a Manovaha sroto vikara predominately of Raja and Tama guna[4]. Acharya kashyap in vedna-adhyay has also mentioned pralap, vaichitya, and arti in Unmada vyadhi[5]. Further, the features of Rakshas Rajasik manas prakriti and Matsya Tamsik manas prakriti are almost on the same wavelength as ADHD. This critical state of Vata Pitta reflects the mind-body interaction and indicates factors such as a vitiation of dhee (rational thinking), dhriti (intellect), and smriti (memory). Ayurvedic interventions, including tridosha-shaman therapy, medhya rasayan (a nootropic drug), and the Panchakarma technique, offer new ways to improve the quality of life for people struggling with ADHD. Many herbal drugs are used effectively to treat ADHD.

Data sources and review process

Four internet search engines were used to look for subject-related published research publications from reputable journals: PubMed, Google Scholar, the AYUSH research portal, and DHARA online. Through the associated publication websites, the full text of those researches is accessible in PDF format. Standard biomedical literature from various life science journals is included in PubMed and Google Scholar[6] international databases. The Ministry of AYUSH, the Government of India, and the AVT Institute for Research, respectively, operate the AYUSH research portal and Digital Helpline for Ayurveda Research Publications (DHARA), complete online indexing services for the articles published in the field of Ayurveda. The phrase "Ayurvedic intervention" encompasses therapies and approaches rooted in Ayurvedic principles, whether administered internally or externally and includes practices such as Panchakarma therapy. It involves utilising herbs or herbal remedies that are either mentioned in Ayurvedic texts or indigenous to the Indian subcontinent. These remedies can take various forms, such as herbal, polyherbal, mineral, or metallic preparations, and can be found in different formats like powders, decoctions, tablets, and so forth, without specific quantity restrictions. Furthermore, in addition to conducting a manual review of the literature, we also conducted cross-referencing of the included studies to identify any supplementary research.

SEARCH STRATEGY

Table 1: PICO strategy for selection

Population	Intervention	Comparison/Control	Outcomes
Attention-Deficit/Hyperactivity Disorder, Manovaha Srotovikara, ASD	Ayurvedic intervention, Ayurvedic therapy, Ayurvedic treatment, Panchakarma, Abhyanga, Snehana, Swedana, Inhalation, Vaman, Virechana, Nasya, Pranayama	There is no treatment or Ayurveda therapy, non-Ayurveda treatment, or non-Ayurveda interventions.	Change in grading system in subjective parameters.

Source of evidence screening and selection

The articles found through manual and computerised searches were examined, and duplicates were eliminated. Then, after reviewing the titles and abstracts of pertinent articles, the texts of the chosen studies were studied using inclusion and exclusion criteria. Only 14 studies were included and reviewed after reading the complete text.

Types of studies

This evaluation only considered clinical trials that were described correctly scientifically. Studies evaluating the safety and effectiveness of Ayurvedic formulations for treating ADHD were considered, whether randomised or not, open-label, single- or double-blinded, pilot studies, or case reports.

Types of participants

Studies conducted with children up to 16 years of age were included in the review. The selection criteria for patients varied from study to study based on the conditions.

Types of interventions

Studies designed to treat ADHD by different Panchakarma procedures along with oral medication or only oral medication are included in the review.

Study selection and exclusion

A total of 40 records were found in the database search, viz. from Google Scholar and PubMed. On elimination of duplicates, a total of 30 records were screened. A total of 14 articles were excluded, as they were review articles irrelevant to this study, so the total full-text articles matched the eligibility. Out of 16 studies, one record was excluded since the age criteria was above 16 years in that study. A total of 14 records were found to meet the eligibility criteria and were finally selected for the current systematic review process.

Figure-1 PRISMA FLOW CHART ILLUSTRATING STUDY INCLUSIONS THROUGH THE STAGES OF THE SYSTEMIC REVIEW

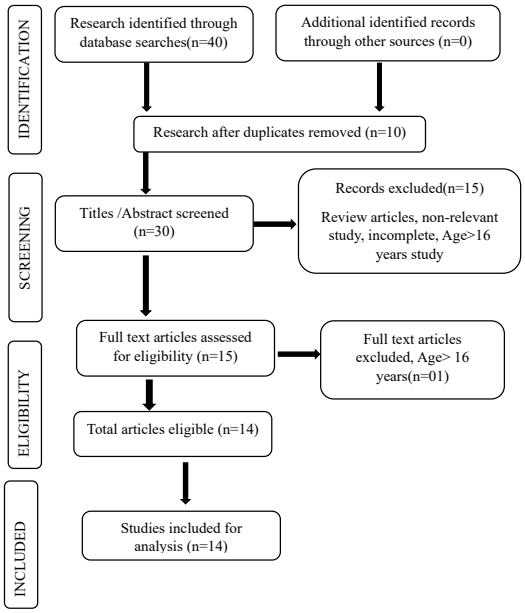

Table 2: Review of different clinical studies on ADHD management

Author name with the year	Study design	Sample size(n) with Age group	Study period	Study intervention	Dosage schedule	Outcome measures
Nisha K. Ojha 2007[7]	Randomised, double-blind, four-arm clinical trial	n=40 (Each group n=10) Age- 6-15 years	90 days	**Group A:** Manas Niyamak Yoga (MN1 granules) **Group B:** Manas Niyamak Yoga (MN1 granules) along with Shirodhara (ksheerdhara) **Group C:** Placebo. **Group D:** Placebo (MN2 granules) along with Shirodhara.	**Group A:**MN1 granules (200 mg/kg/day in 2 divided doses with milk) **Group B:** MN+ Shirodhara (30-45 min) daily for 2 weeks **Group C:** Placebo. **Group D:** Placebo (MN2 granules, dose-same as MN1) along with Shirodhara.	Improvement in obtained scores in Coefficient of Division of Attention Span, Reaction Time, Finger dexterity test, and DSM-IV criteria.
Vaishali Dhotre [8] 2023	Single case study	n=1 Age- 4.5-year male child	116 days	**Deepan Pachan:** 1. Hinguavasthak churna 2. Shaman Aushadhi: Medhya Rasayana herbs (Mandukparni, Guduchi, Shankhpushpi, Yashtimadhu, Brahmi, Ashwagandha) 3. Brahmi Ghrita **Panchkarma:** 1.Bahya snehana with Ksheerbala Taila 2. Shirodhara with Brahmi and Jatamansi Taila 3.Matra Basti with Ksheerbala Taila 4.Pratimarsh Nasya with Panchendriyawardhan Taila **Post-Discharge:** 1. Saraswat arista with gold 2.Kalyanaka Ghrita.	**Deepan Pachan:** 1. Hinguavasthak churna (2.5 mg BD) with ghee for 5 days. 2.Shaman Aushadhi: Medhya Rasayana herbs (Mandukparni, Guduchi, Shankhpushpi, Yashtimadhu, Brahmi, Ashwagandha) mixed (30 mg), taken 2.5 mg BD with honey. 3.Brahmi Ghrita (1 tbs in the morning) for 1 month. **Panchakarma:** 1.Bahya snehana with Ksheerbala Taila (21 days). 2.Shirodhara with Brahmi and Jatamansi Taila (21 days). 3.Matra Basti with Ksheerbala Taila (30 ml, 7 days). 4.Pratimarsh Nasya with Panchendriyawardhan Taila - 2 drops in each nostril (7 days). **Post-Discharge:** 1. Saraswata arishta with gold: 1 tbs BD with lukewarm water (2 months). 2.Kalyanaka Ghrita: 1 tbs in the morning OD (2 months).	Improvement in symptoms of DSM-5 criteria on hyperactivity, impulsivity, and attention deficit
Mohini Shivdas Fagne [9] 2020	Single case study	n=1 Age- 3.6-year male child	51 days	**1st Sitting:** Musta arista Agnitundi vati Abhaya arista Kalyanak Ghrita Sarvanga Abhyanga with Ksheerabala Taila Nadi swedana with Vatashamak Kashaya Matrabasti with Bala Taila + rock salt **2nd Visit:** Sarvanga Abhyanga with Lakshadi Taila Shashtishali pindasweda Shirodhara with Bala Taila + Til Taila Matrabasti with Dashamula Taila + rock salt Discharge Medicines: Saraswata arista with Gold, Mustarishta, Hinguvachadi Gutika **3rd Sitting:** Saraswata arista with Gold Kalyanak Ghrita Sarvanga Abhyanga with Lakshadi Taila Nadi Sweda Shirodhara with Ksheerbala Taila + Tila Taila Matrabasti with Dashamula Taila + rock salt	**1st Sitting:** Musta arista: 5ml BD BF with lukewarm water Agnitundi vati: 125 mg BD AF with lukewarm water Abhaya arista: 5ml BD before food with water Kalyanak Ghrita: 5ml at bedtime with milk **Panchakarma procedures** Sarvanga Abhyanga with Ksheerabala Taila Nadiswedana with Vatashamak Kashaya Matrabasti with Bala Taila + rock salt (1st day-10 ml, increased 5 ml each day up to 5th day then on 6th and 7th day 30 ml) Shiropichu with Bala taila Discharge medication: Kalyanak ghrita 5 ml in morning for 15days Avipattikar churna 2.5 gm at night **2nd Visit:** Mustaarishta: 7.5ml BD BF with lukewarm water Saraswata arishta 2.5 ml BD Hinguvachadi gutika halt tab BD AF **Panchakarma procedures** Sarvanga Abhyanga with Lakshadi Taila Shashtishali pindasweda Shirodhara with Bala Taila + Til Taila Matrabasti with Dashamula Taila + rock salt Discharge Medicines: Saraswata arista with Gold, Mustarishta, Hinguvachadi Gutika **3rd Sitting:** Saraswataarishta with Gold: 2.5 ml morning and bedtime Kalyanak Ghrita: 5 ml in the morning with milk **Panchakarma procedures-** same as 2nd sitting	Improvement in symptoms of DSM-5 criteria on hyperactivity, impulsivity, and attention deficit
Mahapatra Arun Kumar [10] 2015	Randomised, double-blind, placebo-control clinical Study	n=35(5 discontinued) Age- 07-13 years	48 days	**Group A**: This group of 15 patients was treated with Ayurvedic formulation Saraswata arista **Group B:** This group of 15 patients was given only placebo syrup	**Group A**: Saraswata arista (01ml/kg/day) **Group B:** placebo syrup	1. NICHQ Vanderbilt assessment scale – parents' informant 2. NICHQ Vanderbilt assessment scale – teacher informant

Vd. Ashwini Patil [11] 2020	Single case study	n= 01 Age- 3.5-year-old boy	90 days	**Panchakarma therapy:** **1.**Sarvanga abhyanga with Tila Taila 2. Shirodhara with Tila Taila **Oral**: 1. Brahmi ghrita 2. Saraswata arishta + Kumarkalyan rasa	**Panchakarma therapy:** **1.** Sarvanga abhyanga with Tila Taila 2. Shirodhara with Tila Taila (20 days BT, done up to 60 days) **Oral**: 1. Brahmi ghrita 5ml OD with madhu 2. Saraswata arishta + Kumarkalyan rasa (5tab) + Suvarna bhasma (50mg) - 5 ml OD for 30 days.	Improvement in symptoms of DSM-5 criteria on hyperactivity, impulsivity, and attention deficit
Rahul Gameti[12] 2017	Single case study	n= 01 Age- 11-year-old boy	21 days	Nasya with Panchendriya Vardhan Taila.	Nasya with Panchendriya Vardhan Taila.	Improvement in symptoms of DSM-5 criteria on hyperactivity, impulsivity, and attention deficit
Usha Pinakin Dave[13] 2014	The open-label study randomised Clinical study	n= 31 Age-6-12 years of age	180 days	The children received SBME (Standardised Bacopa monnieri Extract)	SBME- 225 mg/d	Improvement in symptoms of DSM-4 criteria on hyperactivity, impulsivity, and attention deficit
Supriya Bhalerao[14] 2013	Randomised open-label, comparative clinical trial	n=40(3 discontinued) Age-6-12 years	60 days	**Pilot study:** Confirmed Brāhmī Ghrita efficacy (n=10). **Therapeutic study(n=27):** **Group A–**Brāhmī Ghrita (n=14) **Group B-**methylphenidate, main study (n=13).	**Group A-** Brāhmī Ghrita- 2 tsf (~10ml) with lukewarm water/milk around 7-8 am on an empty stomach **Group B-**Methylphenidate	**Plot study:** Improvement in symptoms of DSM-4 criteria on hyperactivity, impulsivity, and attention deficit **Therapeutic study:** Improvement in DSM-IV criteria/Dupaul ADHD rating scale without other co-morbid psychiatric conditions. Added cognitive improvement via Mindomatics software
Akshay Gurav[15] 2022	Single case study	n=01 Age- 7 year old female child	258 days	**1st Sitting** **(30/08/2021 - 08/08/2021):** Initial treatment steps include Krimimudgar Rasa and Udwartana. Nadi Sweda, Sadhyo Virechana, Shiro dhara, Sarvanga Abhyanga, Matra Basti. Medications: Saraswata arishta, Syp Memorin, Smriti granules, Asyapratisrana. **2nd Sitting** **(29/09/2021 - 06/10/2021):** Udwartana, Nadi Sweda, Sarvanga Abhyanga, Nadi Sweda, Takradhara, Matra Basti. Medications: Brahmi Vati Swarna Yukta, Brahmi Ghrita, Asyapratisrana. **3rd Sitting** **(15/11/2021 - 23/11/2021):** Udwartana, Nadi Sweda, Shirodhara, Sarvanga Abhyanga, Matra Basti. Medications: Brahmi Vati Swarna Yukta, Brahmi Ghrita **4th Sitting** **(21/03/2022 - 29/03/2022):** Udwartana, Smriti Sagara Rasa, Brahmi Ghrita, Pratimarsha Nasya. **5th Sitting** **(22/04/2022 - 29/04/2022):** Shirodhara, Sarvanga Abhyanga, Matra Basti, Smriti Sagara Rasa, Brahmi Ghrita, Pratimarsha Nasya **6th Sitting** **(03/05/2022 - 11/05/2022):** Udwartana, Sarvanga Abhyanga, Nadi Sweda, Matra Basti, Shiro Pichu. Medications: Saraswata arista, Brahmi Ghrita, Brahmi, Vacha, Ashwagandha Churna	**1stSitting** **(30/08/2021 - 08/08/2021):** Initial treatment steps include Krimimudgar Rasa 1-0-1 AF and Udwartana with kola kulatha + godhuma churna f/b Nadi Sweda (same in 2nd, 3rd, 4th and 6th sitting) Sadhyo Virechana with Gandharvahastadi taila 10 ml with warm milk for 1-day Shiro-dhara with Dashmola kwatha, Sarvanga Abhyanga with Ksheerbala taila, Matra Basti with Ksheerbala taila 20 ml (same in 2nd sitting) Medications: Saraswata arista with gold 10 drops OD with milk on E/S (same in 6th sitting), Syp Memorin 5 ml OD, Smriti granules 1 tsp OD bedtime, Asyapratisrana with Trikatu, Yashtimadhu, Vacha churna BD (same in 2nd and 5th sitting) **2nd Sitting** **(29/09/2021 - 06/10/2021):** Trikatu Churna½ tsf TID Takradhara with Brahmi, Yashtimadu, Vacha, Rasna, Ashwagandha Churna Brahmi Vati Swarna Yukta1-0-0with milk E/s, Brahmi Ghrita =5ml-0-5ml (same in 6th sitting) Shirodhara with Brahmi Taila, Sarvanga Abhyanga with Mahanarayan taila, Matra basti with Mahanarayan taila Brahmi Vati Swarna Yukta1-0-0 with milk E/s, Brahmi Ghrita 5ml-0-5ml, Syrup Mentrich 0-0-5 ml **4th Sitting (21/03/2022 - 29/03/2022):** Sadhyo Virechana with TrivrutLeha-15gm with milk on E/S, Matra Basti with Kalyanaka Ghrita-20 ml, Smriti Sagara Rasa1-0-1 Brahmi Ghrita 5ml-0-5ml Pratimarsha Nasya with Anu Taila2/2 ------0—2/2 **5th Sitting** **(22/04/2022 - 29/04/2022):** Shirodhara with Brahmi taila, Matra Basti with MahakalyanakaGhrita-20 ml, Smriti Sagara Rasa1-0-1 Brahmi Ghrita 5ml-0-5ml Pratimarsha Nasya with Anu Taila 2/2 ------0—2/2 **6th Sitting** **(03/05/2022 - 11/05/2022):** Sarvanga Abyanga with Mahanarayana Taila f/b Nadi Sweda Matra Basti with Brahmi Taila 20ml Shiro Pichu with Brahmi Taila Brahmi, Vacha, Ashwagandha Churna 0-0-1/2 spoon with honey at bedtime	Improvement in signs and symptoms of ADHD
Kshama Gupta[16] 2013	Randomised, comparative clinical trial	n=20(10 in each group Age- 5 and 12 years.	30 days	In Trial group, Naladadi ghrita In the control group, Kushmanda ghrita	Naladadi ghrita - 5 ml twice a day through oral route before intake of food Kushmanda ghrita -5 ml twice a day through oral route before food	Change in scores of ADHD rating scale (DSM-III-R symptoms of ADHD)
Narges Hosseini[17] 2019	Randomised, placebo-controlled, double-blind, parallel groups trial	n=34(3 un-willing for study: 15 in control group, 1 drop out and 16 in placebo group, 2 drop out) Age-7-12 years	42 days	**Intervention Group:** Received Withania somnifera root extract **Control Group:** Received placebo	**Intervention Group:** Received Withania somnifera root extract given in different dosages a/c to the physician (125 mg QD, 125 mg BID, 250 mg BID)	Significant reduction in hyper-sensitivity centralisation and anxiety scores
Veena Kalra[18] 2002	Randomised double-blind placebo-controlled drug trial	n=195, only 60 satisfied DSM-IV criteria Age-6-12 years	180 days	30 children received Mentat 30 children received a placebo	Mentat- 2 tablets/day Placebo-2 tablets/day	Clinical Measures: Psychological tests were performed by the same observer during pre and post 6 months drug trial evaluation. The tests included a Coding subtest (MISIC), four subtests of Kaufman Assessment Battery for Children (KABC), Conner's 10-point rating scale and to

						Bender Gestalt test for young children.
Harish Kumar Singhal[19] 2010	Randomised placebo-controlled drug trial	n=70(12 discontinued) Age- 6-16 years	90 days	**Participants:** Children are divided into three groups. Groups: Group A: 17 received Ayurvedic compound I syrup. Group B: 14 received Ayurvedic compound I (Brahmi, Ashwagandha, Tagar) syrup + Shirodhara with milk. Group C: 12 received Ayurvedic compound II (placebo) syrup.	**Dose** Drug dose: 1.0 ml/kg body weight. Shirodhara- 45 min/day over 2 weeks.	Change in reaction time assessed by a Vernier chronoscope (electronic).
Punam Sawarkar [20] 2022	A Single Case Study	n=01 Age- 09-year-old male child	38 days	**Panchakarma Procedure:** Utsaadana: Triphala Churna, Dashmoola Taila. Sarwanga Abhyanga with Dhanwantara Taila. Nadi Swedana with Dashmoola Kwatha. Nasya with Brahmi Ghrita Matra basti Brahmi Ghrita Kashaya Basti with Brahmi Ghrita (150 ml), Triphala Kashaya (100 ml), Guda (10gm), Madhu (10ml), Saindhava Lavana (5gm), Kalka (Madanphala, Bilva, Kushta, Yavani, Shatpushpa, Musta - 6gms **During Admission Treatment (7 days):** Agnitundi Vati Manasmitra Vatakam Brahmi Ghrita **Discharge Medicines (1 month)**: Amapachaka Vati Sarsawata Churna Manasmitra Vatakam with Gold Brahmi Ghrita: I	**Panchakarma Procedure:** Utsaadana: 2-day duration Sarwanga Abhyanga: 7 days Nadi Swedana: 7 days. Nasya: 7 days, 4 drops/nostril. Matra Basti: 7 days. (50 ml). Kashaya Basti: 7 days. Drugs: Brahmi Ghrita Total = 280 ml. **During Admission Treatment (7 days):** Agnitundi Vati: 1 tab twice daily before food. Manasmitra Vatakam: 1 tab twice daily after food. Brahmi Ghrita: Half tsp twice daily before food. **Discharge Medicines (1 month)**: Amapachaka Vati: 1 tab twice daily before food. Sarsawata Churna: 3 gms twice daily after food with honey. Manasmitra Vatakam with Gold: 1 tab twice daily after food. Brahmi Ghrita: Half tsp twice daily before food.	Improvement in scores of ADHD (DSM V)

Table 3: Review of Results in different studies on ADHD management

Author and year	No. of group	Result
Nisha K. Ojha 2007	04	**Results for hyperactivity criteria:** Groups A, B, and D improved significantly (P<0.001). Group A, B > C (P<0.001). Group B > D, A (p<0.01), indicating combined treatment synergy. Group A > D (P<0.05), highlighting the drug's superiority. **Results for Impulsivity criteria:** All groups improved significantly in impulsivity (P<0.001), with C showing 15.74% improvement. B outperformed A moderately (p<0.02) and significantly surpassed C and D (P<0.001, P<0.01). Groups A and D had insignificant advantages over C, highlighting combined treatment efficacy. **Reaction Time (RT) change:** Group A, B, D: Significant improvement (P<0.001). Group C: Results insignificant (P>0.10). Group B > A (P<0.01), indicating drug-Shirodhara synergy. Group A, B, D > C (p<0.001). Group A moderately > D (P<0.02), highlighting the drug's efficacy over Shirodhara. **Coefficient of Deviation of Attention change:** Group A, B: Highly significant change (P<0.001). Group D: Significant change (P<0.01). Insignificant inter-group differences suggest similar effectiveness among groups.
Vaishali Dhotre 2023	Single case	**Improvements** 1.Completes tasks when asked to do. 2.Seems to listen when speaking to him too directly. 3.Memory power increased can memorise and explain past incidents. 4.Sits quietly in a place, then ask him to sit. 5.Mild improvement in speech 6.Able to concentrate on things or to give attention
Mohini Shivdas Fagne 2020	Single case	**1st Sitting Results**: Mildly reduced hyperactivity Irregular bowel movements persist Distractibility remains **After 2nd Sitting:** Moderately reduced hyperactivity, focus, stillness, and home cooperation. **Changes After 3rd Sitting:** Significant improvement in hyperactivity, inattention, and communication skills. Child responsive and aware of bodily needs.
Mahapatra Arun Kumar 2015	02	Participants who take "Saraswata arista" have significantly improved their academic performance, activities, intelligence, social skills, and literacy. No side effects occurred. This suggests that "Saraswata arista" may reduce ADHD symptoms.
Vd. Ashwini Patil 2020	Single case	Treatment improved responsiveness, task completion, memory, communication, stillness, speech, and eye contact. **Score before treatment –**Inattention - 19, Hyperactivity & Impulsivity -17 **Score after treatment –** Inattention - 9, Hyperactivity & Impulsivity -10
Rahul Gameti 2017	Single case	Panchendriya Vardhan Taila course: Reduced hyperactivity and aggression, with mild improvement in school performance.
Usha Pinakin Dave 2014	01	SBME significantly reduced most ADHD symptom subtest scores, except for social problems. **Improvements observed** Restlessness: 93%children. Self-control: 89%children. Attention deficit: 85% of children. Learning problems: 78% of children. Impulsivity: 67% children. Psychiatric issues: 52% of children. 74% showed up to 20% reduction, 26% exhibited 21% to 50% reduction in total subtest scores.
Supriya Bhalerao 2013	02	**Pilot study:** Brāhmī ghrita led to a 66% ADHD score reduction. Significant decrease in ADHD scores post-study compared to baseline. Inattention symptoms were more affected (18.56 ± 2.69 to 5.55 ± 4.90) than impulsivity symptoms (17.33 ± 4.41 to 6.00 ± 4.60), both significantly improved compared to baseline. **Therapeutic study:** Brāhmī ghrita improved ADHD scores by 16%, mainly in inattention symptoms. Total ADHD and inattention scores are significantly better than baseline. No impact on impulsivity score. Similar psychomotor test response with both medications. Methylphenidate boosts neurotransmitters for hyperactivity and impulsivity. Brāhmī ghrita's mechanism requires further exploration.
Akshay Gurav 2022	Single case	**1st Sitting:** Mild decrease in hyperactivity. Slight increase in concentration. **2nd Sitting:** Improved spelling. Enhanced concentration. Increased social activeness. **3rd Sitting:** Reduced irritability. Fear reduction. Improved spelling and recognition. **4th Sitting:** Improved memory. Enhanced concentration.

		Better recognition. Improved ability to spell. **5th Sitting:** Enhanced concentration. Improved recognition. Decreased hyperactivity. Started attending school. **6th Sitting:** Improved concentration. Better recognition. Positive social behaviour. Formed new friendships.
Kshama Gupta 2013	02	Both Naladadi ghrita and Kushmanda ghrita effectively reduced ADHD symptoms by 35% and 38.68%, respectively, on the ADHD Rating Scale. Statistical analysis (paired and unpaired 't'-tests) indicated no significant difference in effectiveness between the two treatments (P > 0.05).
Narges Hosseini 2019	02	RCMA Scores: The Intervention Group decreased from 21.21% to 8.29% (-61%); the Control Group decreased from 20.21% to 15.43% (-23.6%) over 6 weeks. Both groups showed decreased ADHD scores, but not significantly different.
Veena Kalra 2002	02	Poor fine motor coordination was prevalent in more children in the placebo group than in the Mentat group (16 vs. 8). The Conner's test showed a statistically significant improvement in the Mentat group compared to the placebo group. The Gestalt closure subtest of the Kaufman Assessment Battery for Children (KABC) also showed a statistically significant improvement in the Mentat group compared to the placebo group. Pre- and post-SPECT scan observations showed improvement in three children in the Mentat group compared to one in the placebo group. No significant difference was found between the Mentat and placebo groups in all other tests.
Harish Kumar Singhal 2010	03	Group B showed highly significant (P<.001) improvement in total reaction time, while in group C, the change was statistically nonsignificant P > 0.10. It was found that while the drug and Shirodhara were both effective in improving the reaction time of ADHD-affected children, the drug combined with Shirodhara was superior to the drug used alone.
Punam Sawarkar 2022	Single case	The child treated showed good relief from the complaints with the help of internal medications: carminative, digestive, and mild laxative in action external oleation and medicated oil enema as suggested by Acharya in treating Unmada. The child was normal during the follow-up period, and the child well tolerated the therapies

Table 4: Treatment strategies adapted for ADHD management

Type of treatment	Intervention	No. of studies
Shaman chikitsa	Manas Niyamak Yoga (MN1 granules)	01
	Hinguavasthak churna	01
	Medhya Rasayana herbs (Mandukparni, Guduchi, Shankhpushpi, Yashtimadhu, Brahmi, Ashwagandha)	
	Brahmi Ghrita	05
	Saraswatarishta with gold	02
	Kalyanaka Ghrita.	02
	Mustaarishta	01
	Agnitundivati	02
	Hinguvachadi Gutika	01
	Saraswatarishta	03
	Kumarkalyan rasa	01
	Standardized *Bacopa monnieri* Extract	01
	Krimimudgar Rasa	01
	Syp Memorin	01
	Smriti granules	01
	Brahmi Vati Swarna Yukta	01
	Smriti Sagara Rasa	01
	Naladadi ghrita	01
	Kushmanda ghrita	01
	Withania somnifera root extract	01
	Tablet Mentat	01
	Ayurvedic compound I syrup (Brahmi, Ashwagandha, Tagar)	01
	Manasmitra Vatakam with gold	01
	Amapachaka Vati	01
Bahya chikitsa	Abhyanga	05
	Shirodhara	06
	Utsadan	01
	Nadi sweda	03
	Shalishastik pinda sweda	01
	Asyapratisrana	01
	Shiropichu	01
	Udwartan	01
Shodhana chikitsa	Matra Basti	04
	Nasya	04
	Virechana	01
	Kashaya Basti	01

DISCUSSION

Of all the 14 studies, 7 have done their trials, including various Panchakarma procedures: sarvang abhyanga and shali shashtik pinda sweda. Both procedures have the same basic concept of potential effectiveness. Acharya Sushruta and Dalhana point out the role of dhamani nutrition in sthanik dhatu, from twacha (skin) to sharir dhatus and again through snehana. This idea applies to shalishashtiki pinda sweda. When the pottali is used, the medicine is absorbed from the pool, reaches the srotas, and does the santarpana karma. The contents of the shali shashtik become fat-soluble and facilitate absorption due to the affinity of biological organisms for lipids. Pinda sweda lasts 20-30 minutes; rubbing improves drug absorption into the skin, dilates local capillaries, and improves permeability. Being a snigdha sweda, its lipid content promotes conduction and convection, sending heat energy through the medicine and the portal to the body[21]. The integration of different textures for tactile stimulation supports sensory integration. Hearing therapy is also used to treat sensitivity to noise. Similarly, two Ayurvedic therapies, shirodhara and abhyanga, can potentially harmonise one's sensory experience. The shirodhara treatment has potential effects like a tranquilising effect, may also have an alpha-adrenergic blocking effect, regulates the hypothalamic endocrine secretions, which regulates the neurotransmitter neurons, has some effect over the limbic system with the hypothalamus; thus, it results in a decrease in most of the psychic and somatic disorders[22]. In a study, the subjects receiving shirodhara treatment showed a reduction in their anxiety levels as per the mood assessment scores. Changes in vital signs, EEG, ECG, salivary cortisol, and urinary catecholamines have also been seen as putative correlates of stress[23]. Nasya dravya is administered using the nasal route. It then travels to Sringataka marma (cavernous venous sinuses) and enters murdha (intracranial circulation). Finally, the nasya drug reaches the junction of netra (eye), karna (ear), and shira (head) via the diffusion method. It was indicated by the Indu commentator of the Ashtanga Samgraha that the shringataka is located on the inner side of the middle part of the head. The vascular system, the nerve plexus of the olfactory nerve, the ophthalmic branch of the trigeminal nerve, and the maxillary branch of the trigeminal nerve all connect the nose to the brain anatomically[24]. Pratimarsha nasya, when used regularly, helps trap the aeroallergens at the surface due to proper oleation and enhancing the guarding function of cilia[25]. Nasya therapy has

been proven a promising therapy in the treatment of ADHD. A study was done on panchendriya vardhan taila nasya. Most herbs contain Vata Pittagna and Kapha Vatagna properties. Mainly, this taila contains teekshna herbs such as Vidang, Pippali and Nidigdhika twaka, which are responsible for srotas cleaning. Vata is considered the master of the mind. All kinds of drugs have Vata-hara property with snigdha and ushna guna. Madhooka and saindhava lavana have Pittahara property. This can help reduce aggressive behaviour and anxiety symptoms. Draksha, Bala, Anshmati, Neelkamal, Manjishtha Swadanshatra, Prapaundarika, the drug has Vatapittagna power. Brihati, Rasna, Nidigdhika twaka and Tila oil contain Kapha and Vatagna property. Saindhvalavana has sookshma properties that help the medicine penetrate and start working quickly. A nasal delivery can increase the percentage of drug reaching the CNS after delivery.

Tila taila has been used in various therapies in different studies, such as shirodhara and sarvang abhyanga, as a base for other oils like Panchendriya taila. Tila taila is of madhura rasa and madghura vipaka, balya, and rasayana in karma; it nourishes and strengthens all the dhatus, checks dhatukshaya, and thus alleviates Vata. Snigdha and guru guna decrease the rukshata of Vata, and with the help of ushna, guna, and ushna veerya, vikasi property, it alleviates Vata. Sesame oil (Tila taila) is a good source of vitamin E (1.4 mg/100 g) and contains magnesium, copper, calcium, iron, zinc, and vitamin B6. Likewise, Dashmoola taila is also being used for abhyanga, shirodhara, and Dashmoola kwath being used for basti and nadi sweda, and they got the significant result. Dashamoola taila's dravya, guna, and prabhava act on kashtartava. Dashamoola has established anti-inflammatory, analgesic, and antipyretic effects. [26]

BASTI CHIKITSA IN AYURVEDA: NOURISHING MIND

Basti chikitsa is the prime treatment modality of Ayurveda. It is also considered as Ardha Chikitsa. Sneha or anuvasana basti promotes the bala of the person who is emaciated and debilitated. About the possibility of the absorption of basti dravyas from the colon, some believe that substances other than water, salt, etc., are not absorbed from the large gut, but this is a physiological phenomenon occurring in day-to-day life, while the colon mucosa under the effect of the medication can be rendered to absorb the unusual substance also from the large gut. Favouring this view, modern medical science suggests some nutrients; enemas are meant for the body's nutrition, where the absorption of carbohydrates, fat, and protein is mentioned. Observation of modern medical science that the administration of sodium chloride improves fat absorption is curiously coinciding with the usage of salt designed by Ayurvedic medical authorities in sadyo-snehana and in many basti dravya preparations along with the different sneha dravyas. Charaka narrates the role played by lavana and the sneha with the words “lavanopitaha snehana snehayantyachiratnaram.” Charaka, while assessing the anuvasana basti, records the digestion of sneha by the words “sneham pachati pavakah”; after digestion, dravyas can be absorbed to cause the effect on the body[27]. Basti treatment modality was clinically studied, and significant changes were observed in the signs and symptoms of the disease. Proper intake of nutrients is essential for the production of neurotransmitters such as serotonin and dopamine, which play an important role in mood regulation. When the body efficiently absorbs vital nutrients, it supports the synthesis of these neurotransmitters, which can contribute to better mood and mental health.

Manas Niyamak Yoga has shown positive results in alleviating ADHD symptoms. Ayurvedic compounds such as MN1 granules have been used with Shirodhara therapy to improve concentration, reaction time, and motor function. MN1 granules include tikta rasa dravya like Brahmi and Mandukparni, pacifies Vata and Kapha, while madhura rasa dravya Shankhpushpi (neuroprotective activity, intellect promoting activity, antioxidant activity, enhances memory function[28], medhya, nidra janana,[29]) pacifies Pitta and Vata. Tikta rasayukta Jatamansi (antioxidant, sedative, tranquilizing, antidepressant-activity, anticonvulsant activity[30]) balances Vata and Pitta, while Vacha (anticonvulsant[31], antidepressant[32], antihypertensive[33], anti-inflammatory, immunomodulator[31], medhya,[34]), Ashwagandha and Vidanga balances Kapha and Vata. The madhura taste of Madhuyashti alleviates Pitta and Vata, and the katu rasatmak dravya Chitraka and Pippali balance Kapha and Vata. The interactions between rasa and doshas highlight individual Ayurvedic interventions and guide future research to understand the mechanisms and treatment of ADHD. Similarly, Saraswata arista, a well-known Ayurvedic healer, has shown positive results in controlling ADHD symptoms. Brahmi in Saraswata arista effectively combats anxiety, depression, and cognitive deficits. The alkaloid compounds of Brahmi exhibit substantial potential in addressing these pathological conditions. As a "Medhyarasayana," Brahmi enhances mental functions and memory, benefiting neurological and psychiatric disorders.[35]

A study conducted by Usha Pinakin Dave showed the effects of a standardised extract of *Bacopa monnieri* (neuro-protective[36], anti- depressant[37], improves motor learning, acquisition[38], psycho-neurological deficits[39], medhya, vedanasthapan,[40]) and a placebo on the control of ADHD symptoms. This study shows positive results, indicating the need for further research.

Besides this, the starting point of any disease is annavahasrotas, so agnideepan will lead to the formation of wholesome ahararasa as a result of rasadhatu being of optimum quality. Hingu in Hingwastak churna and Hingu in Hinguvachadi churna have agni deepan properties [41]. Brahmi ghrita has a beneficial effect on learning and memory[42]. Drugs given in the form of ghee are rapidly absorbed and distributed in the target areas of the body, like the nervous system. Ghrita kalpana has the upper hand by virtue of its yogavahi, inbuilt rasayana properties, etc. rasayana drugs incorporated with ghrita media thus give better action in these conditions[43].

SUGGESTIONS

The quality of the evidence must be improved in the Ayurveda field. Tools like blinding and randomisation are effective at raising the quality of clinical trials. If at all possible, a controlled trial should also be planned. Incorporating a larger sample size into the clinical investigation is recommended.

CONCLUSION

In this systemic analysis, we reviewed multiple studies examining various Ayurvedic interventions and treatments for treating ADHD. Some treatment combinations appear to exhibit synergistic effects, suggesting a multifaceted approach to ADHD management. Many studies have reported positive results, such as improved concentration, decreased hyperactivity, and better communication skills. However, it is important to acknowledge the limitations of these studies, including small sample sizes, lack of controls, and differences in treatment protocols. Further research with larger sample sizes and rigorous study designs is needed to establish the effectiveness and safety of these interventions in managing ADHD. This systemic analysis highlights the need for more comprehensive, evidence-based research on Ayurvedic approaches to ADHD. These studies provide a promising basis for alternative treatments, but further

research is necessary to verify their efficacy, safety, and applicability in the broader context of ADHD treatment.

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