

RECENT RESEARCHES ON AYURVEDIC HERBS IN THE MANAGEMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDERS (ADHD) IN CHILDREN.

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ABSTRACT:

Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorders. ADHD is characterized by inattention, including increased distractibility and difficulty sustaining attention, poor impulse control and decreased self-inhibitory capacity, and motor over activity and motor restlessness. Children with ADHD have been found to have cognitive deficits, lower IQ, impaired social relationships with in the family and with peers as well as poor study skills and lower academic achievement. In *Ayurveda* it occurs due to vitiation of *dhee* (rational thinking), *dhriti* (intellect / retaining power of the mind), *smriti* (memory) which results into improper contact of the senses with their objectives and give rise to inattention, hyperactivity and impulsivity. At present existing treatment has severe side effects. Latest researches in *Ayurveda* has given a new hope to parents of ADHD child. All the Material for this review paper was collected by open med, PubMed, Google scholar search engine along with several Ayurveda text books which concluded that various *Ayurvedic* herbs can be helpful to manage ADHD proficiently.

Key Words: Attention deficit hyperactivity disorder (ADHD), Learning aid, Nootropic.

INTRODUCTION:

Behavioral and emotional disorders are now the leading cause of disability in children and adolescents^[1]. Visualize having difficulty to pay attention to directions in the school, retaining the lessons, performing well in the school and staying organized. Envision letting yourself or letting your loved ones down, because you can't cope with study & responsibilities. One explanation for this could be a condition known as ADHD, often associated with children. Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorders. ADHD is characterized by inattention, including increased distractibility and difficulty sustaining attention, poor impulse control and decreased self-inhibitory capacity, and motor over activity and motor restlessness. DSM-IV (American Psychiatric Association, 1994).

ADHD affected children possess poor learning, peer relationship, below average cognitive functioning, increase rate of school dropouts and learning disabilities. It often continues into adolescence and adulthood and can cause a lifetime frustration and emotional pain.

ADHD is classified into three subtypes,

- Predominantly Hyperactive-Impulsive Type. Behavior marked by hyperactivity and impulsivity, but not inattentiveness

- Predominantly Inattentive Type. Behavior marked by inattentiveness, but not hyperactivity and impulsivity
- Combination Type. A combination of hyperactivity/impulsivity and inattentive symptoms. This is the most common type of ADHD

According to the 2000 edition of DSM-IV- TR, ADHD affects 5-8% of all children in the U.S. (APA, 2000) the prevalence of ADHD in the general population of school age children is about 3-5% in the west^[2], ADHD is 4-6 times more common in boys than in girls^[3]. Ratio varies between 2:1 and 4:1^[4]. Male to female ratio ranges from 4:1 to 9:1^[5] male to female ratio was 6.4:1^[6].

In *Ayurveda* neither this disease nor the symptoms of ADHD are described but some references about abnormal behavior are discussed under features of *vataprakriti Anavasthita Chittatva Mano vibhrama, Buddh ivibhrama, Smriti vibhrama, Sheela vibhrama,*

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Cheshta vibhrama, and *Achara vibhrama* can be correlated with ADHD^[7].

According to *Ayurveda*, the main reason for ADHD is vitiation of *dhee* (rational thinking), *dhriti* (retaining power of the mind), *smriti* (memory) which causes abnormality and abnormal conduct resulting into improper contact of the senses with their objectives and give rise to inattention, hyperactivity and impulsivity.^[8] To understand the etiology of ADHD in *Ayurveda*, it's important to understand the two *subdoshas* involved in memory. These are *PranaVata*, which governs the brain, sensory perception, and the mind; *Sadhaka Pitta*, which governs the emotions and their effect on the functions of the heart.

The first line drug therapy for ADHD is the use of drugs like, CNS stimulant, Antidepressants, Alpha 2, agonists and Norepinephrine reuptake inhibitors. Although these agents are the first choice medication and the response rate for any single stimulant drug is nearly 85%^[9] these agents produce various Undesirable side effects, which is one of their greatest drawbacks. Above all, these drugs have potential for abuse and addiction. Another disadvantage noted with short acting stimulant is the "rebound effect", i.e. worsening of behavior above baseline behavior following the wearing of medication^[10].

Ayurveda holding a different view regarding the etiopathogenesis of diseases can provide novel theories of ADHD and thus novel dimensions to its management. As etiopathogenesis points towards involvement of *PranaVata*, *Sadhaka pitta* (Brain & mind) hence *Medhya drugs* (Nootropic Herbs) & *vata* pacifying herbs are main line of treatment of ADHD. Hence, drugs which possess nootropic, cognitive, learning aid, and neuroprotective are selected in ADHD to manage clinical features.

OBJECTIVES:

1. To find out evidence based herbs helpful in the treatment of ADHD.
2. To find out mechanism behind these herbs to treat ADHD.
3. To evaluate a safe, effective and side effects free treatment.

MATERIALS AND METHODS:

The material for this review paper was collected from the articles searched through open med, PubMed, Google scholar by using the key words ADHD, *Ayurveda*, *nootropic*, *ashwagandha*, *brahmi* and *Mandookparni* along with *Ayurvedic* textbooks. All the related research articles, clinical and experimental studies from 1980 to till date were reviewed for desired properties & discussed under following groups.

Effect on learning aid

In one study, Alcoholic extracts of *Bacopamonniera Linn. (Brahmi)* was showed improvement in maze learning (learning performance) of rats which is due to saponins/bacosides A&B.^[11]

The major chemical constituents shown to be responsible for the memory-facilitating action of *BM* are the steroidal saponins and bacosides A and B^[12]

Another study suggests that *Mandukaparni (Centellaasiatica Linn.)* An aqueous extract of *C. asiaticaleaf* modulated dopamine, 5-HT and noradrenaline systems in rat brain has shown improved learning and memory processes in vivoA.^[13]

To investigate the effects of *Glycyrrhiza glabra*, on learning and memory, the elevated plus-maze and passive avoidance paradigm were employed to evaluate learning and memory parameters. Three doses (75, 150 and 300 mg/kg p/o) of aqueous extract of *G. glabra* were administered for 7 successive days in separate groups of mice. The dose of 150 mg/kg of the aqueous extract of *liquorice (G.Glabra)* significantly improved learning and memory of mice^[14]

A study undertaken to assess the potential of *Nordostachys jatamansias* a memory enhancer, elevated plus maze and the passive avoidance paradigm were employed to evaluate learning and memory parameters. Three doses (50, 100, and 200 mg./kg. p.o.) of an ethanolic extract of *N. jatamansi* were administered for 8 successive days to both young and aged mice. The 200 mg/kg dose of *N. jatamansi* ethanolic extract significantly improved learning and memory in young mice^[15]

In a study 36 children in the 8-10 year age group were selected for a double blind, randomized trial. 19 were given 50 mg of *Bacopa* twice daily, 17 others received placebo. After 12 weeks of treatment, the children were subjected to a battery of specialized tests. The data revealed a significant improvement in the areas of sentence repetition, logical memory and pair associative learning (matching things that go together, e.g. "test" and "grade") in all 19 ADHD children who took *Bacopa*^[16]. A study to test the efficacy of *Bacopa* children for six weeks, 50 normal school children split into two groups were given either *Bacopa* or placebo. At the conclusion, they were evaluated for attention, concentration, and memory. *Bacopawas* shown to improve mean reaction time (auditory and visual) significantly^[17].

Nootropic Activity

In a study, daily administration of *Ashwagandha* root extract (50,100 and 200 mg/kg orally) for 6 days significantly improved memory consolidation in mice.

Receiving chronic electroconvulsive shock (ECS) treatment. *Ashwagandha* administered on day 7, also attenuated the disruption of memory consolidation, produced by chronic treatment with ECS. On the elevated plus maze *Ashwagandha* reversed the scopolamine (0.3mg/kg) induced delay in transfer latency on day 1. On the basis of these findings it is suggested that *Ashwagandha* exhibits a nootropic like effect in naive and amnesic mice^[18].

A study indicate that treatment during postnatal developmental stage with *Centellaasiatica* extract can influence the neuronal morphology and promote the higher brain functions of juvenile and young adult mice^[19]

EFFECT ON COGNITION

In a study, *Bacopa monnieri* significantly improved speed of visual information processing measured by the IT task learning rate and memory consolidation compared to placebo, with maximal effects evident after 12 weeks^[20]. In an experimental study, an extract of *B. monnieri* was given to albino rats to measure its effect on three newly acquired behavioral responses: brightness discriminating, condition avoidance and continuous avoidance. The facilitating effect of the *Bacopa* was clearly discernible in all three learning responses, augmenting both the rat's cognitive function and mental retention capacity. The rats learned faster, retained more of what they had learned, and remembered it longer. The chemical

Constituents responsible for the facilitating effect of *Bacopa* on learning schedules were identified as a mixture of *bacosides A and B*. The bacosides also enhanced vital protein activity and produced an increase in protein synthesis in the hippocampus, a part of the brain that is important for long-term memory^[21]

To investigate the effect of *Bacopa* in school children aged 6-8 years, 40 children were given *Bacopa syrup* equivalent to 1 g. dried herb daily for 3 months, in a single-blind design. Immediate memory, perception and reaction/performance times improved with *Bacopa* treatment^[22].

A study undertaken with the objective of studying the effect of *Tinospora cordifolia* (Tc) on learning and memory in normal rats and on cyclosporine induced memory deficits, both alcoholic and aqueous extract of *T. cordifolia* enhanced the cognition in normal rats as were seen in behavioral tests – Hebb William maze and the passive avoidance task^[23].

Isolated constituents of *W. somnifera* (Sitoindosides VII-X and Withaferine – A) increased cortical muscarinic acetylcholine receptor capacity partly explaining the cognition enhancing and memory improving effects traditionally attributed to *Ashwagandha*^[24].

DISCUSSION:

Review of the various clinical and experimental studies of different Ayurvedic *Medhya* drugs reveals that these drugs possess nootropic, cognition enhancing, learning aid, Anticonvulsant, neuro-protective properties that brings homeostasis in vitiated Doshas & calm down ADHD symptom.

N. jatamansi is useful as memory restorative agent as it facilitates cholinergic transmission in the brain. *T. cordifolia* is helpful in improving the learning capacity and memory restoration. *W. somnifera*, by increasing cortical muscarinic acetylcholine receptor capacity, can enhance memory.

Ashwagandha and *Centella* possess nootropic activity. *Bacopa* and *Ashwagandha* have the potential for corrective effect in cognitive deficit, while *Centella* can influence the neuronal morphology and can thereby promote higher brain functions.

Regarding the effect on cognition, the drugs *Bacopa*, *G. glabra*, *Centella*, *N. jatamansi*, *T. cordifolia* and *W. somnifera* may be useful. *Bacopa* has potential for revitalization of intellectual functions and may improve the higher order cognitive functions such as learning and memory. It has also showed effect on positive behavior modification by increasing the level of serotonin. *Centella* can induce memory retention an improved learning capacity by increasing dendritic arborization in amygdaloidal nucleus.

Studies also indicate that *Bacopa* can produce significant improvement in different areas of child's functioning in ADHD children and it can also improve the mean reaction time (Auditory and Visual) significantly. *Bacopa* can also improve the behavior by increasing the serotonin level in brain.

CONCLUSION:

In a nut shell it is concluded that these herbs can provide a perfect answer to ADHD affected children which are absolutely side effect free. Among all discussed herbs *Bacopa monniera* Linn. (*Brahmi*) & *Centella asiatica* Linn. (*Mandookparni*), *Ashwagandha* alone is proved very potent to control inattention, hyperactivity, Impulsivity and distractibility, though further clinical studies are required to establish it in scientific world.

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