



Role of Ayurvedic Herbs in the Management of Attention Deficit Hyperactivity Disorder in Children

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Review Article

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Abstract

Ayurvedic system of medicine has a treasury of description of several Ayurveda herbs that elevate the mental as well as intellectual power primarily claimed as 'Medhya'. Firstly, the *Rasayana* drugs which are mentioned in *Charaka Samhita* called 'Medhya Rasayana' are supposed to be having specific influence on brain functions. Cognitive deficit can be present from birth or result from environmental causes such as brain damage, mental illness, or neurological abnormalities. This causes significant restrictions to the ability to learn and operate, like in ADHD. Sufferer of this clinical entity children stay confused, unable to do daily routine work normally, face difficulty in learning and understanding, unable to focus on one thing at a time. In Ayurvedic literature, impairment of memory is mentioned as *Smriti bhramsha* which occurs due to vitiation of *Raja* and *Tama dosha*. It has been noted that cognitive functions are thoroughly affected due to stress, anxiety and other related psychological disorders. It has been explained that *Medha* (intellect) and *Buddhi* (wisdom) get deteriorated in this condition. Some features of ADHD are resembled with *Unmada*. *Medhya* drugs mentioned in Ayurveda have multi-dimensional actions including effect on memory. These not only enhance the intellectual capacity but also rejuvenate the whole body system and their pathways. This review article delineates the introduction of ADHD, its Ayurvedic association and the herbs that are effective in management of ADHD.

Keywords: ADHD; Ayurveda; *Buddhi*; *Medha*; Herbs; *Unmada*

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is marked by an ongoing pattern of inattention and/or hyperactivity and impulsivity that persist up to six months to a degree that is inconsistent with developmental level and

that negatively affects the social and academics achievements [1]. Statistics shows an upward trend in the prevalence of ADHD. Attention Deficit Hyperactivity Disorder afflicts approximately 2-7% of children globally. ADHD prevalence in India, however, is much higher than the global average. In a study, it was found that ADHD prevalence in primary school

children to be higher than the global estimate, at 11.32%. The highest prevalence is found in ages 9 (at 26.4%) and 10 (at 25%) [2]. About one third to one half of patients with ADHD will have persistent symptoms in to adulthood, children with untreated ADHD often have a life time of sufferings and often have a number of associated complications. Structural, functional, physiological abnormalities in various regions of the brain by complex interactive operations of genetic and environmental factors lead to the pathogenesis of ADHD. Person with Inattention [3] means a person may have difficulty staying on task, sustaining focus, and staying organized, and these problems are not due to defiance or lack of comprehension. Hyperactivity [4] means a person may seem to move about constantly, including in situations when it is not appropriate, or excessively fidgets, taps, or talks. In adults, hyperactivity may mean extreme restlessness or talking too much. Impulsivity [5] means a person may act without thinking or have difficulty with self-control. Impulsivity could also include a desire for immediate rewards or the inability to delay gratification. An impulsive person may interrupt others or make important decisions without considering long-term consequences. Diagnosis of ADHD is done on the basis of Behavioural Rating Scale i.e. DSM V criteria, history of presenting problems, involvement of CNS, chronic illness, sensory impairment, sleep disorders, medications and any first degree relative suffering from ADHD or any behavioural disorder. Educate parents about ADHD is the foremost management of ADHD. Behavioural therapy along with medications was the mainstay of treatment. Behavioural strategies should be followed during treatment of ADHD affected children like clear and explicit instructions to the child about desirable behaviour, well - structured routine for child at home.

Aims and Objectives

- To review the literature for *Ayurvedic* management of A.D.H.D (Attention Deficit Hyperactivity Disorder).
- To elaborate the mode of action of *Medhya* herbs which are effective in the management of ADHD.

Materials and Methods

Classical texts of Ayurveda like *Charaka Samhita*, *Sushruta Samhita* and modern textbook including digital media, Ayush Research Portal, PubMed, Google Scholar and other websites on internet regarding the subjects utilized as source material in the study.

Ayurveda Perspective of Adhd

In *Ayurveda* classics there is no specific description of ADHD, although some symptoms of ADHD is found scattered in *Ayurveda* classics under the description of *Unmada*.

Unmada sign and symptoms are characterised as psychiatric/ psychosomatic disorders in *Ayurveda*. It is characterised by vitiation at the level of *Mana*, *Buddhi*, *Sangya*, *Gyana*, *Smriti*, *Bhakti*, *Sheela*, *Cheshta* and *Achara* [6]. In *Mano Vibhrama* person's mind loss control over senses, reacts on unwanted stimuli, impaired deduction and decision-making. In *Buddhi Vibhrama* impairment in cognition of *Indriyarthas* by respective *Indriya*, leads to improper perception of things like ephemeral and harmful things as useful or vice versa. ADHD child shows risky behaviour due this affliction. *Jana Vibhram* results, child not able to take proper decision in proper time which leads to inappropriate action. Due to *Buddhi* and *Gyana Vibhrama* that leads to difficulty in reading and writing in ADHD. *Smriti Vibhrama* is due to imbalance in *Raja* and *Tama Guna* results in inability of child to learn, unable differentiate between which condition is right and wrong because of lack of learning from past experiences. Therefore, child blurts out answers at wrong time and place. In *Bhakti Vibhram*, child may show interest in strange things that may cause dangerous action. In *Sheela Vibhrama*, child may suffer from sleep disturbance, interest in eating only a particular taste of food and drinks, day sleep and night awakening. In *Cheshta Vibhram*, child may get involve in fidgets and quarrel because of impaired inhibitory function. Psychic constitutions *Raja* and *Tama Prakriti* shows abnormal behaviour. *Unmada* is a psychosomatic mental disorder in which *Manovaha Srotas* are chiefly affected. The properties of *Manas* are '*Anutwa*' and '*Ekatwa*' i.e., subtly and singleness or oneness. Due to its singleness, only single knowledge occur at a time. *Manas* remains engaged in a particular sense organ and cannot perceive two or more objects at a time.

The core symptoms of ADHD include inattention, hyper activity and impulsivity. Inattention (*Anavasthita chitatwam*) due to derangement of *Dhee*, *Drithi* and *Smriti*, mind loses its capacity of concentration, attention and learning and the person indulges in irrelevant tasks and dangerous activities. *Vata vridhi* and *Rajo Vridhi* causes *Manovibhrama* by the properties of *Chalatwa* and *Anavasthitatwam*. Hyperactivity (*Cheshtavibhrama*) explained by *Chakrapani* as *Anuchita Cheshta* or improper activities such as runs about or climbs in situations where it is not appropriate, excessive talking etc. In ADHD, an increase in the *Chalatwa Gunam* of *Vayu* and *Raja* leads to hyperactivity. *Dhrithi Bhramsa* (derangement of controlling and regulating power of mind) also leads to hyperactivity. Impulsivity is similar to the term '*Autsukya*' caused by *budhi vibhrama*, which has been explained by *Hemadri* as '*Avicaarya Karya Pravriti*' [7]. Due to this, the person get lost himself in the *vishayas* and take sudden decisions without considering the consequences and situations and result in impulsive actions or thoughts. Due to *Smriti vibhramsa* also, the child is unable to learn from past experiences and thus behave impulsively. According to *Kasyapa* [8], a child with *Unmada* shows the symptoms

like *Vaichityam* (instability of mind), *Pralapam* (incoherent speech) and *Arati* (inattention).

Dhee vibhram	Intellectual confusion
Satwa pariplawa	Excessive spontaneous mind wandering
Adheerta	Fear and anxiety
Abhadhavakatwam	Indistinct and incoherent speech
Hridyam ch shunyam	Sensory processing problems
Paryakula drishti	Altered control of visual fixation and saccadic eye movements

Table 1: General sign and symptom of *unmade* [9] in correspondence to ADHD.

Herbs Effective in ADHD

As the symptoms of the disease ADHD are common as that of *Vatapittotara Unmada*, therefore the treatment adopted should be of the same. As the mind and the body are a functional continuum, this condition can be approached with *Sodhana* and *Shamana* and *Chittaprasadana* measures, taking care of the age *Prakriti*, *Dhatu Sarata* and *Bala* of child and concerning the indications and contra indications.

In *Ayurveda*, management of ADHD can be done with the herbs, and food that are indeed beneficial for the optimum functioning of the body as well as the brain. These herbs effect on the brain to attain calmness or a stimulation of activities. They also produce neuronutrient effect by improving cerebral metabolism too. Thus, these drugs works on the intellect (*Dhee*), retention power (*Dhriti*) and memory (*Smriti*). *Medhya* drugs are known to have specific effect on mental performance by promoting the functions of "*Buddhi*" and "*Manas*" by correcting the disturbances of "*Rajas*" and "*Tamas*" which is vitiated in ADHD child. The *Medhya* effect of drugs can be considered as *Prabhava janya* (unthinkable and unimaginable). This attribution holds good since the action of *Medhya Dravya* cannot be related to a particular quality of the drug. Maintaining of normal functioning of *Sadhaka Pitta* and *Tarpaka Kapha* present in *Hridya* is the desired place of action for any *Medhya* drug. *Medhya* drugs also act on *Manasika bhavas* (faculties of mind) by relieving anxiety, stress etc.

Medhya Rasayana is group of medicinal plants described in *Ayurveda* with multi-fold benefits, specifically to improve memory and intellect by *Prabhava* (specific action). *Medha* means intellect and/or retention and *Rasayana* means therapeutic preparation that on regular practice will boost nourishment, health, memory, intellect, immunity and hence longevity. *Medhya Rasayana* is a group of four medicinal

plants that can be used singly or in combinations. They are *Mandukaparni* (*Centella asiatica* Linn.), *Yastimadhu* (*Glycyrrhiza glabra* Linn.), *Guduchi* (*Tinospora cordifolia* (Willd) Miers) and *Shankhapushpi* (*Convolvulus pleuricaulis* Chois), specially mentioned with wide range of applications on different systems. Other beneficial drugs used with similar aim are *Brahmi* (*Bacopa monniera*), *Jyotishmati* (*Celastrus panniculata*), *Vacha* (*Acorus calamus*), *Jatamamsi* (*Nardostachys jatamamsi*) and *Kushmanda* (*Benincasa hispida*). These used either single or combination form.

***Mandukaparni* (*Centella asiatica* Linn.):** Major constituents present in *Mandukaparni* are saponins, medacoside, asiaticoside, medacassoside and Asiatic acid, a new triterpenic acid [10]. Asiatic acid (AA), a penta cyclic triterpene in *Mandukaparni*, possess neuroprotective effects both *in vitro* and *in vivo* [11]. They act on behaviour besides being neuroprotective and brain growth promoters. Dendritic arborization is supposed to be the neuronal basis for improved learning and memory [12]. Studies showed that *Centella asiatica* Linn. accelerates nerve regeneration on oral administration and contains multiple active fractions increasing neurite elongation *in-vitro* [13].

***Yasthimadhu* (*Glycyrrhiza glabra* Linn.):** Glycyrrhizin (GL) is a triterpene present in the roots and rhizomes of liquorice (*Glycyrrhiza glabra*). It is found to have neuroprotective effect in the Kainic acid induced neuronal cell death in mouse [14]. The roots and rhizomes of *G. glabra* has been studied with respect to spatial learning and passive avoidance [15]. Liquorice has significant action on memory enhancing activity in dementia, it significantly improved learning and memory on scopolamine induced dementia [16]. The isoflavones, glabridin and hispalglabridins A and B of *G. glabra* Linn. have significant antioxidant activity. The antioxidants protect susceptible brain cells from the oxidative stress, resulting in reduced brain damage and improved neuronal function, thereby enhancing the memory [17]. Memory strengthening activity of *Yasthimadhu* in exteroceptive and interoceptive behavioural models of memory is also shown by other investigators [18].

***Guduchi* (*Tinospora cordifolia* (Willd) Miers.):** Chemical constituents' classes are alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoids, phenolics, aliphatic compounds and polysaccharides [19]. *Tinospora cordifolia* (Willd) Miers. has been claimed to possess learning and memory enhancing and antioxidant activities [20,21] and anti-stress activity [22]. *Tinospora cordifolia* enhanced the cognition in normal and cognition deficits animals in behavioural test Hebb William maze and the passive avoidance task [17]. It is useful for treatment of *Bhrama* (Vertigo), in improving behaviour disorders, mental deficit and IQ levels [23]. It has been proved that it enhances verbal

learning and memory and logical memory (of immediate and short-term type), cognition (learning and memory) in normal rats and cyclosporine induced memory deficit, anti-stress, anti-depressant and anxiolytic properties, improvement in sensible memory impairment [24].

Shankhapushpi (Convolvulus pleuricaulis Chois.): Important chemical principles are microphylllic acid, shankhapushpin, kaempferol-kaempferol-3-glucoside, 3, 4 dihydroxycinnamic acid and sterols. According to studies, extract of *Convolvulus pleuricaulis* and its ethyl acetate and aqueous fractions were evaluated for their memory enhancing properties [25]. BR-16A (Mentat) a poly-herbal combination containing *Shankhapushpi* significantly reversed the social isolation stress-induced prolongation of onset and decrease in pentobarbitone-induced sleep, increased total motor activity [26]. *Shankhapushpi* calms hyperactivity, impulsivity by regulating the body's production of the stress hormones, adrenaline and cortisol [27]. In another study it was proved that *Shankhapushpi* compound (containing *Shankhapushpi*, *Sarpagandha*, and *Gokshura* in equal quantities) found to be effective in ameliorating symptoms of *Chittodvega* (anxiety disorders) [28].

Brahmi (Bacopa monnieri (L.) Wettst.): *Bacopa monnieri* is a well-known nootropic plant reported for its tranquilizing [29], sedative action, and cognitive enhancer. Plant extracts and isolated Bacosides have been extensively investigated in several laboratories for their neuro pharmacological effects and number of reports are available confirming their Nootropic action. Preliminary studies established that treatment with plant [30] on rats, alcoholic extract increases both cognitive function and retention capacity, decreases retrograde amnesia and protects from phenytoin - induced cognitive deficit [31]. *Brahmi rasayana* might prove to be a useful memory restorative agent in the treatment of dementia [32]. Administration of *Bacopa monnieri* for two weeks, also reversed the depletion of acetylcholine, the reduction in acetyl cholinesterase activity and the decrease in muscarinic cholinergic receptor binding in the frontal cortex and hippocampus, induced by neurotoxin, colchicines [33].

Jyotishmati (Celastrus paniculatus Willd.): Seed oil of *Jyotishmati* is known for *Medhya* action. This oil contains several terpenoids like paniculatadiol, b-sitosterol, celastrol, b-amyrin, pristimerin [34]. According to some research work, seed oil of *Celastrus paniculatus* Willd reverse scopolamine-induced deficits in navigational memory task in young adult rats [35]. *Celastrus paniculatus* oil treatment for 14 days showed beneficial effect on chronic restraint stress-induced cognitive deficits. It restored spatial learning and memory, showed anti-anxiety activity in stressed condition. This work provides a novel perspective on beneficial effect of herbal

therapy on stress-induced cognitive dysfunctions [36].

Kushmanda (Benincasa hispida (Thumb.) Cogn.): Phytochemical analysis of *Benincasa hispida* shows presence of alkaloids, flavinoids, saponins and steroids [37]. It has a tissue protective preventive effect on colchicine induced Alzheimer's disease via direct and indirect antioxidant activity [38]. *Kushmandadi Ghrita* showed significant results in the management of *Chittodvega* (anxiety disorders) [39].

Vacha (Acorus calamus Linn.): Rhizome is useful part having *Medhya* quality. It has been used in Indian and Chinese systems of medicine for hundreds of years to cure diseases especially the central nervous system (CNS) abnormalities [40]. Active chemical principles are α -asarone, elemicine, cis-isoelemicin, cis and Trans isoeugenol and their methyl ethers [41]. Good in clearing speech to the children [42,43] and useful in schizophrenic psychosis [44].

Jatamansi (Nardostachys jatamansi DC.): Rhizome is used for medicinal purposes as it is *Bhutaghna* or *Manasa Doshahara* (relieves psychiatric problems) and *Medhya* [45] Roots and rhizomes of *N. jatamansi* DC. are used to treat hysteria, epilepsy, and convulsions [46]. The decoction of the drug is also used in neurological disorders, insomnia and disorders of cardiovascular system [47]. It is proven to be effective in improving learning and memory in mice [48].

Discussion

A.D.H.D. is a disease that has disagreements about its diagnosis and treatment options. So the disease remains ignored, despite commonly affecting children, resulting in increasing the prevalence year after year. Its prevalence, comorbidities and adverse impact show an upward trend. Parents first go for modern medications, which are not very effective. According to *Ayurveda*, the management of ADHD can be done by balancing the vitiated *Vata Dosha* (*Prana*, *Udana* and *Vyana*) that affects *Manoarthas* and *Manokarmas* and in turn leads to inattention, hyperactivity and impulsivity. So the main mode of treatment is to bring vitiated *Vata Dosha* back to normalcy and proper maintenance of *Agni*. The herbs useful in ADHD are having the properties of *Ama Pachana* as well as *Agni Deepana* along with bringing back of *Prakupita Vata Dosha* back to normalcy. Treatment includes *Vata-Pitta* pacifying herbs and *Medhya Rasayanas* substances which improve cognitive function, such as *Brahmi*, *Mandukaparni*, *Yasthimadhu*, *Vacha*, *Jatamansi*, *Shankhapushpi* etc. to control inattention, hyperactivity, impulsivity, and distractibility. The following herbs can help children achieve proper brain function and improve their reading, writing, and learning abilities. The properties of drugs are described, demonstrating that herbs can help children with psychosomatic disorders and cognitive deficits. These herbs are a gift for children

who are suffering from stress and anxiety not only in school but also in society. Various *Acharya* describes these herbs as *Medhya*, which are later on proved as memory enhancer and helpful in attaining mental health by modern medical system. *Acharya Charak* and *Sushrut* both mentioned four herbs under *medhya rasayana* i.e., *Mandukparni Swarasa*, *Yashtimadhu Churna* with *Ksheer*, *Guduchi Swarasa*, and *Shankhapushpi Kalka*. These help to perform various brain functions and helps to attain anxiety free life. These drugs of *Medhya Rasayana* are easily available and every person of any age group can consume it without having any side effects. *Medhya* herbs gives it best effect if consumed with its proper vehicle and proper mode of administration, ultimately *Vata* controlled auto correction of *Rajo Guna* occurs as well as correction of *Tamas Guna* which aids in reduction in ADHD sign and symptoms.

Conclusion

Ayurveda system of medicine is no more behind the modern medicine system as it is capable enough to cures physical as well as mental abnormalities. *Ayurveda* is a holistic science that provides solutions for psychosomatic disorders in a fruitful way without any complication to the patient. In the present scenario, herbs of *Ayurveda* can be used to obtain effective results in memory related disorders, cognitive deficits, etc. Based on above it can be said that Ayurveda medicine system is very effective in the treatment of ADHD and other psychosomatic disorders.

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