Importance of medicinal plants in the treatment of central nervous system disorders - A review

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(Received: May 24, 2015; Revised received: December 11, 2015; Accepted: December 14, 2015)

Abstract: Herbal treatment is the natural form of healing or alternative therapy, where herbs or plants are used in the form of extract, pills, syrup to cure diseases of humans or it is the use of plants (herbs) to treat disease and enhance wellbeing. Herbal treatment is used to treat a range of disorders including anxiety, depression, high blood pressure, hormonal imbalance, migraines, skin problems and other disorders. Herbal medicine has its origins in ancient cultures including those of the Egyptians, Americans, Indians and Chinese. At present, thousand of plant metabolites are being successfully used for the treatment of variety of disorders. The World Health Organization estimated that 80% of people worldwide rely on herbal medicines for some part of their primary health care. Increased side effects, lack of curative treatment for several chronic diseases, high cost of new drugs, microbial resistance and emerging, diseases are some reasons for renewed public interest in plant based medicines. Some of the plants which are used in the treatment of mental disorders are sage, ginkgo, cowhage, valeriana, kava, hops, ginseng, sarpagandha, these plants and their chemical constituents are very helpful in protecting the human against central nervous system (CNS) disorders.

Keywords: CNS (mental) Disorders, Medicinal Plants, High Blood Pressure and Sarpagandha

Introduction

Rapid industrialization, changes in lifestyle, environmental degradation and excessive use of pesticides, herbicides and other toxic chemicals in production of food materials are seriously threatening the life of human beings and posing health hazards. These toxic chemicals/xenobiotics produce neurotoxins that affect the transmission of chemical signals between neurons resulting into different central nervous system (CNS) disorders. CNS disorders could be categorized crudely by their symptoms and not in biochemical or clinical terms such as is done in orthodox medicine today. The disorders of CNS are categorized as follows: 1) Neurodegenerative disorders it includes Alzheimer's disease (AD) and Parkinson's disease (PD). 2) Diseases associated with electrophysiological malfunction it includes Epilepsy. 3) Suppression of the CNS it is associated with Lack of motor activity (difficulty in muscle movement). Inability to concentrate and apathy towards external factors (lack of interest). Drowsiness (feeling abnormally sleepy during day) and depression. 4) Overexcretion of the CNS. It is associated with following factors, frenzied (wild) physical activity, inability to concentrate and irrational behavior and thoughts, mania severe insomnia, markedly increased energy and inappropriate social behaviour. 5) Conditions displaying excessive aspects of normal function. These are catagarised as follows.

a) Algesia- sensation of pain. b) Migraine- particular type of pain, focused in the head. It is obvious from some of the symptoms that CNS activity is affected due to the migraine attack. C) Nausea and Vomiting- are important aspects of normal body function in protecting the body from harmful ingested substances. However, they can be inconvenient in some situations, such as travel, pregnancy, radiation therapy, and medication. Increased nausea and vomiting also affects CNS activity.

Herbal Treatment for CNS Disorders

CNS disorders that are seen by an effect on activities mainly associated with the CNS are considered. Cognition, alertness and sedation will be considered as targets for treatment with plants and their constituents. As the activity of a plant or its extract relies fundamentally on its chemical constituents, most of the plants mentioned below affect the CNS by providing compounds that act in the same, or opposite, way as the chemical transmitters found in the brain, which accelerates or inhibits the chemical transformations in the CNS. Hence, the herbal treatment protects the CNS directly or indirectly against harmful chemicals or processes.

Alzheimer's Diseases

Perry et al., 1999 clinical studies have demonstrated that extracts of Ginkgo biloba provide therapeutic benefits to Alzheimer's. The gingkolesides present in Ginkgo biloba posses’ activities pertinent to the disease mechanisms in Alzheimer’s such as antioxidant, neuroprotective and cholinergic activities. Various clinical studies have indicated that 3- to 6-month treatment with 120- 240 mg of G. biloba has produced significant effect in Alzheimer’s patients and this herbal drug has shown no significant adverse effect. Mahdy et al. (2012) investigated that the treatment of AD-induced rats with Salvia triloba and Piper nigrum, total extracts significantly reduced the oxidative stress status and ameliorates the neuro degeneration characteristic of Alzheimer’s diseases in rats the high dose of Salvia triloba (750 mg.kg b. wt.), showed more interest in improvement Alzheimer’s disease as indicated by both biochemical and histopathological investigations. The effect of Salvia triloba and Piper nigrum were achieved through the powerful anticholinesterase activity and antioxidant capacity of these plants. These results represented good
therapeutic approaches for intervention against progressive neurological damage associated with Alzheimer’s disease with special reference to the oxidative insults. Dézsi et al. (2002) studied that Vinpocetine is a chemical derived from vincamine, a constituent found in the leaves of Catharanthus roseus, common name periwinkle (Vinca minor) as well as the seed of various African plants. It is used as a treatment for memory loss and mental impairments. Studies have demonstrated that Vinpocetine posses’s potential to enhance cerebral blood flow and neuroprotective effects. Szatmari et al. (2003) investigated that the clinical trials of Vinpocetine on 728 patients with AD have produced significant result in the improvement of cerebral blood flow and neuroprotective effects. Szatmari et al. (2003) reviewed concluded that vinpocetine cannot yet be regarded as a proven treatment. Currently, several better-quality trials are underway.

**Parkinson’s disease**

Sandhu and Rana (2013) carried out an experiment to evaluate Anti Parkinson’s Activity of Ethanolic Extract of Nigella sativa seeds (EENS) in Chlorpromazine (CPZ) induced experimental animal model. The effects of ethanolic extracts of Nigella sativa (200 and 400 mg/kg, p.o) was studied using in-vivo parameter like catalepsy. The cataleptic scores was significantly found to be reduced, with the Nigella sativa (200 and 400 mg/kg, p.o). The results suggest the Anti Parkinson’s activity of Nigella Sativa due to its Anti Cataleptic and Neurochemical responses. Nigella sativa was found to possess a therapeutic effect against Parkinson’s disease in chlorpromazine induced animal PD models. Katzenschlagcr V. et al. (2014) L-dopa is a precursor of dopamine, which is used to treat Parkinson’s disease by increasing the level of dopamine in Substantia nigra (Substantia nigra is a brain structure located in the midbrain that plays an important role in reward, addiction, and movement), by inhibition of monoamine oxidase (MAO), which metabolize dopamine into less active compound. The rapid onset of action and longer on time without concomitant increase in dyskinesias on mucuna seed powder formulation suggest that this natural source of L-dopa might possess advantages over conventional L-dopa preparations in the long term management of PD. Assessment of long term efficacy and tolerability in a randomised, controlled study is warranted. Mohammad et al. (2010) studied that the aqueous extract of valerian (200, 500 and 800 mg/kg; intraperitoneal) had anticonvulsant effect. However, Petroleum ether extract and CPT (20M) had proconvulsant effect. Administration of CPT (10M) before the administration of aqueous extract decreased the anticonvulsant effect of valerian. The results showed significant anticonvulsant effect for aqueous extract of valerian. Moreover, CPT as a selective adenosine A1 receptor antagonist decreased the anticonvulsant effect of valerian aqueous extract. Therefore the anticonvulsant effect of valerian probably is mediated through activation of adenosine system. **Epilepsy**

Sakina et al. (1990) investigated that Ethanolic extract of leaves of O. sanctum L. have been used as smooth muscle relaxants and reported to possess diuretic properties. They have been known to prolong the time of lost reflex in mice due to induced convulsions. Naderi et al., 2010 Studied the Anticonvulsant Activity Of Salvia verticillata Extract (SVE) at 125-2000mg/kg b.wt. SVE at 2000 mg/Kg produced 80% protection. The results showed that pre treatment of mice with various doses of SVE produced Anticonvulsant effects when the animals were exposed to two different depression models. These models are the most generally used preclinical tests for Anticonvulsant screening. Dried seed kernels of Caesalpinia crista extract have a potential as a learning and memory enhancer (Nadkami and Nadkami 1976). Kshirsagar (2011). Reports suggest C. crista can be beneficial in improving cognition in disorders like demential and other neurodegenerative disorders. Kirtikar and Basu (1989) stated that according to Ayurveda, the heartwood is bitter, astringent, sweet, constipating, sedative, hemostatic. It is useful in conditions of burning sensation, wounds, ulcers, leprosy, skin diseases, diarrhoea, dysentery, epilepsy, convulsions, menorrhagia, leucorrhea, diabetes and haemorrhages. Alan and Gaby (2007) studied that Gamma amino butyric acid (GABA), the principal inhibitory neurotransmitter in the cerebral cortex, maintains the inhibitory tones that counter balances neuronal excitation. When this balance is perturbed, seizures may occur. Mills and Bone (2000) studied that Western herbalists are familiar with Withania (Ashwaganda), and it is used as tonic. In Western herbal medicine, decoction or extract made from the root is a popular remedy from the ayurvedic tradition, as an ‘adaptogen’ remedy and for the treatment of debility and nervous exhaustion, for convalescence and as a general tonic. Fernandes et al., (2012) evaluated the anticonvulsant activity of a hydroalcoholic extract of P. barbat us leaves on seizures induced by strychnine sulphate (2.0 mg/kg) Forskolin treatment is likely to exert neuroprotective effects by increasing cellular levels of neurotrophin-3 (NT-3) NT-3 up regulation by forskolin is
likely to inhibit seizure development and seizure-related synaptic reorganization. Phytochemical studies on *P. barbatus* have revealed numerous bioactive compounds: notably diterpenoids including forskolin, plectranthone J, plectrin, coeleon E, coleon F, plectrinone A, plectrinone B. *P. barbatus* extract was found to have marked anticonvulsant activity against strychnine-induced convulsions.

Dezsi et al. (2002) and fung et al. (2007) Since Parkinsonism is an age related neurological disorder, researchers induced the ageing effects in mice using D-galactose and Sodium nitrite (NaNO2) since D-galactose causes oxidative damage, inflammation, cognitive impairment and abnormality in biochemistry markers such as SOD, MDA and catalase in nervous system and Sodium nitrite (NaNO2) causing memory consolidating disability in mice. Thereby a study was conducted to investigate the effect of *Scutellaria baicalensis* Georgi (SBG) against ageing in ICR female mice. D-galactose and NaNO3 induced oxidative stress, changes like decreased SOD and catalase activities, increased MDA levels in mice brains and impaired cognitive function were reversed and significantly improved by *Scutellaria baicalensis* Georgi ethanolic extract. These findings demonstrate the valuable role of *Scutellaria baicalensis* against oxidative stress in parkinsonism.

### Depression and Anxiety

Selvi et al., 2012 studied that the administration of different doses of the ethanolic extract of *Centella asiatica* in Wister rats was able to induce antidepressant effects. In forced swimming test, the extract can decrease the immobility time in rats with mild sedative effect. It was found that *Centella asiatica* can produce antidepressant like activity at a dose of 100mg and 200mg/kg body weight in a dose dependent manner. Present study confirmed that the *Centella asiatica* ethanolic extract has the antidepressant activity as its significantly reduces the immobility time and increases the exploratory behaviour during depression in animal models. Trivedi and Sharma, 2011 studied that the daily treatment with *Glycyrrhiza glabra* (100 and 200 mg/kg) & fluoxetine (10 mg/kg i.p.), of stressed mice significantly, decrease latency to enter, increased the number of entries and time spent in mirror chamber as compared to normal control (stressed) mice and act as an anti-anxiety drug. *Glycyrrhiza glabra* produced anxiolytic effect possibly by decreasing plasma cortisol levels.

Trivedi and Sharma 2011 evaluated the hyperalgesic response of root extract of *Glycyrrhiza glabra*. The daily treatment with *Glycyrrhiza glabra* (100 & 200 mg/kg) and fluoxetine (10 mg/kg i.p.) Increases the tail flicking time of stressed animals as compare to control mice. Antidepressants have been known to induce a dose-dependent antinoceptive effect in mice. Since chronically stressed animals present a hyperalgesic response, this raises the possibility of alterations induced by chronic stress associated with the regulation of antinoception. Ambawade et al. (2001) studied the anxiolytic activity of hydro alcoholic extract of *Glycyrrhiza glabra* in Albino Swiss mice. Mice received varying doses (10-300mg/kg i.p.) of hydroalcoholic extract of *Glycyrrhiza glabra* and anxiolytic activity was assessed using different paradigms like elevated plus maze, foot shock-induced aggression, and amphetamine-induced stereotypy. In all the animal models of anxiety, lower doses of hydro alcoholic extract were more effective in alleviating anxiety. The hydro alcoholic extract of roots and rhizomes of *Glycyrrhiza glabra* possesses anxiolytic activity.

Tiwari et al. (2014) noticed that hydro alcoholic extracts of *Syzygium aromaticum* L. at 100 and 200 mg/kg, intraperitoneally showed a significant increase in time spent in light (423 and 460 seconds, respectively), when compared with control. This might be due to interaction of numerous flavonoids and alkaloids which are responsible for anxiolytic properties of *Syzygium aromaticum* L. Presence of flavonoids and alkaloids in clove showed effect on CNS. Hence, the clove posses anti-anxiety activity.

### References


