Ethanobotanical, Phytochemical, Pharmacological profile medicinal plants with the potential to treat Alzheimer's disease and its complications

Ashwin Singh Chouhan*, Ashish Purohit

Jai Narain Vyas University (New Campus), Jodhpur, Rajasthan, India

Abstract

Alzheimer’s disease (AD) may be a progressive nervous disorder of the brain named after German physician Aloes Alzheimer, who first described it in 1906. Alzheimer’s is the commonest sort of dementia and affects an estimated 10 million people worldwide. The foremost common sort of dementia is AD, which demolishes the vital brain cells, causing trouble with memory, thinking, and behavior, brutal enough to affect work, lifelong hobbies, and social life. Recognized factors in Alzheimer’s disease include acetylcholine deficiency, free radicals, and inflammation of the brain tissue. Many of the present drugs taken to treat the disease, such as, donepezil, have unpleasant side effects and doctors are keen to seek out alternatives. There’s no cure for Alzheimer’s disease, but drugs designed to slow disease progression are available. Some herbs may help to enhance brain function, but scientific evidence to prove that they will treat Alzheimer’s disease, is restricted. On-line database like MEDLINE, LILACS, Cochrane Library, dissertation Abstract (USA), National Research Register, Current Controlled trials, Center watch Trials Database, and PsychINFO Journal Article bases were wont to look for information associated with studies done on plants within the past years. The target here is to supply a scientific review of the continued evidence concerning the utilization of medicinal herbs within the treatment of Alzheimer’s disease (AD) and its associated symptoms.

Introduction

Alzheimer’s disease (AD) is a brain disorder named after the German physician Aloes Alzheimer, who first described it in 1906. Alzheimer’s disease is a progressive neurodegenerative disease that mainly affects the general population over 65 years of age. They are estimated to account for 50 to 60 percent of dementia cases. [1] Prevalence increases exponentially with age, from 3.0% in 65-74-year-old patients to 47.2% in 85-year-old individuals. [2,3] This condition is characterized by progressive memory loss, impairment of virtually all intellectual functions, increased apathy, decreased speech function, disorientation, and erratic walking. Electronic databases such as MEDLINE, LILACS, Cochrane Library, Essay Abstract (USA), National Research Register, Current Control Trials, Center watch Trials Database, and PsychINFO Journal Articles are used to find information related to articles botanical studies over the years. The study combined the terms Alzheimer's disease, dementia, cognitive decline, herbal remedies, and herbal medicine. The brain has 100 billion nerve cells (neurons). Each neuron connects with many other cells to form a communication network. Groups of neurons have special tasks. Some engage in thinking, learning, and remembering. Others help us see, hear, and smell. To do their job, brain cells act like little factories. They receive supplies, generate energy, make equipment, and dispose of waste. Cells also process and store information and communicate with other cells. To make things work, it needs coordination as well as an abundance of fuel and oxygen. Beta amyloid peptides, with 39 to 42 amino acid residues (BAPs), play an important role in the...
development of AD. Although there is no cure for AD, it can be controlled with available medications to some extent. Several studies have found that natural antioxidants, such as vitamin E, vitamin C, and beta-carotene, can help scavenge free radicals produced during the onset and progression of disease of this disease. Memory loss is thought to be the result of a lack of acetylcholine, a neurotransmitter. The level of this emitter can be increased in the brain by inhibiting the activity of the enzyme acetylcholinesterase, which breaks down or breaks down the emitter. Drugs that inhibit the breakdown of the messenger or acetylcholine transmitter slow the progression of the disease. [4] Alzheimer’s disease is the most common form of dementia.

Other Types of Dementia

Alzheimer's disease accounts for 50-70% of dementia cases. Other disorders that can cause memory loss, confusion, and other symptoms associated with dementia include: Vascular dementia, often considered the second most common type of dementia, refers to a decrease in blood flow to parts of the brain. One type can develop after a major stroke that blocks blood flow to most brain tissue. Another type, formerly known as "multi-infarct dementia," can occur when a series of very small strokes block small arteries. Individually, these strokes are too small to cause significant symptoms, but over time their combined effects become noticeable. The symptoms of vascular dementia can be similar to those of Alzheimer’s disease. These include memory problems, confusion, and difficulty following instructions. In some cases, the decline associated with vascular dementia can occur in "stages" rather than the slow, steady decline commonly seen in Alzheimer's disease. Mixed dementia is a condition in which Alzheimer's disease and vascular dementia occur together. Some experts believe that this combination is also very popular. There is some evidence that this type of dementia is much more common than previously believed. Parkinson's disease affects movement control, causing tremors, stiffness, and speech problems. Many people with Parkinson's disease also develop dementia in the later stages of the disease. Lewy body dementia often begins with a major change in attention and alertness. People affected by this disease often experience visual hallucinations as well as muscle stiffness and tremors similar to those associated with Parkinson's disease. Physical trauma to the brain from car crashes or other trauma can damage or destroy brain cells and cause symptoms of dementia, such as behavioral changes, memory loss and other cognitive difficulties. Huntington's disease is an inherited and progressive disease that causes irregular movements of the arms, legs, and facial muscles; personality changes; and reduced ability to think clearly. CreutzfeldtJakob disease (CJD) (CREVZfelt YAH kob) is a rare and rapidly fatal disease that impairs memory and coordination and causes behavioral changes. Recently, "variant CreutzfeldtJakob disease" (vCJD) has been identified as a human disorder attributed to eating cattle affected by "mad cow disease". Temporal dementia or Pick's disease is another rare disorder that is sometimes difficult to distinguish from Alzheimer's disease. Personality changes and disorientation often precede memory loss. Normal pressure hydrocephalus (NPH) is caused by a buildup of fluid in the brain. The cause of most cases is unknown. Symptoms include difficulty walking, memory loss, and an inability to control urine. NPH can sometimes be corrected surgically to drain excess fluid out of the brain. [5]

Causes and Risk Factor

The causes of Alzheimer’s disease are under investigation in several areas. Several genes are involved in the development of Alzheimer’s disease. Although genetic factors can increase a person’s chance of developing Alzheimer’s disease, environmental factors are thought to play a role as well. On the other hand, several environmental factors have been found to be associated with the development of Alzheimer's disease, including long-term exposure to silicon or aluminum,[6] chronic exposure to other toxins, free radicals, [7] and pain. Head injury. Biometric (Cu, Zn, Fe) homeostatic deregulation and oxidative stress in brain cells are key features of the pathogenesis of Alzheimer's disease (AD). [8] During the 1960s and 1970s, aluminum emerged as a possible cause of Alzheimer's disease. This suspicion has raised concerns about daily exposure to aluminum through sources such as casseroles, foil, beverage cans, antacids and antiperspirants. Since then, studies have not confirmed aluminum's role in the onset of Alzheimer's disease, but few experts believe that continued exposure to sources of aluminum may pose a threat. There is growing evidence that risk factors for vascular disease - including diabetes, high blood pressure and high cholesterol - may also be risk factors for Alzheimer's disease and related dementia related to stroke. [5]

Signs and Symptoms

Memory impairment is the hallmark symptom of Alzheimer’s disease and usually involves behaviors such as forgotten appointments, away from home, misplaced items, and repetitive questions. Along with memory problems, AD can be recognized by insomnia, anxiety, depression, disruptive behavior, and hallucinations. Several studies have found evidence that Alzheimer’s disease is a disease that is caused by or is a result of decreased metabolic activity in the brain. Alzheimer’s disease has been classified into three stages and each stage has its specific symptoms. Stage one usually lasts two to four years. It involves confusion, forgetfulness, disorientation, recent memory loss, and mood changes. Stage Two often lasts two to ten years. It is typically characterized by decreased memory reduced
attention span, hallucinations, restlessness, muscle spasms, reduced to perform logic, increased irritability, and increased inability to organize thoughts. Stage Three generally lasts one to three years with risk factors that include age, head injury, and most often involve incontinence, swallowing difficulty, the development of skin infections, and seizures. [9]

Diagnosis

It is very important to get an early and accurate diagnosis of Alzheimer’s disease in order to effectively treat it as early as possible. These herbal treatments should begin (along with regular brain exercises) immediately after diagnosis to maximize the potential of leading a normal and healthy life.

Alzheimer’s disease can be reliably diagnosed with a complete examination that includes the following tests:

- A complete medical and psychiatric history
- A neurological examination
- Laboratory tests to rule out anemia, vitamin deficiencies, and other conditions
- A mental status examination to evaluate the person’s thinking and memory
- Talking with family members or caregivers

Mental Status Examination Diagnostic tests for Alzheimer’s disease: One of the key diagnostic tests for dementias such as Alzheimer’s is the Mental Status Examination (MSE). N the Mini-Cog test takes about three minutes to administer and is often used in Emergency Departments, for people who appear to have some type of dementia like Alzheimer’s disease. N Urinalysis Urine test: N Routine analysis of urine is just one of the tests that your doctor will do if Alzheimer’s disease or another type of dementia is suspected. Urinalysis (urine tests) screens for abnormalities. Urinalysis can detect a number of diseases or conditions where symptoms may be similar to dementias such as severe renal disease. N Mild Cognitive Impairment (MCI) N People may sometimes fear the onset of dementia, whereas, they will be experiencing mild cognitive impairment. N Visual Clues to Dementia Diagnosis N There are a number of strong visual clues that can indicate that someone may be suffering from a dementia such as Alzheimer’s disease. Appearance, dress, and personal hygiene may deteriorate. Visual clues are important, but provide only one aspect of human behavior and presentation that may lead to diagnosis. N Lumbar Puncture test N Although uncommon in tests of dementia the lumbar puncture can reveal rare diseases that can mimic the signs of dementia N The Mini Mental State Examination (MMSE) is most commonly used to test for memory problems and contributes to a possible diagnosis of dementia. [10] N The electroencephalogram (EEG) is a useful tool in the diagnosis of Alzheimer’s. Those with the disease have a diffuse and symmetrical slowing of the brain waves that register on the EEG. [9]

Medicinal Herbs to Treat Alzheimer

A number of scientific researchers have been carried out on medicinal herbs. Herbs have anti-inflammatory and antioxidant activities that may be used in the treatment of AD. Alzheimer’s patients have an acetylcholine deficiency. Anti-inflammatory herbs may reduce inflammation of the brain tissue in Alzheimer’s: German chamomile, Ginseng, licorice, turmeric, and white willow bark. Acetylcholine is a neurotransmitter that plays a key role in cognitive function and reasoning. The brains of those with mild-to-moderate Alzheimer’s disease, a progressive type of dementia, have abnormally low acetylcholine concentrations. This means that any compound that enhances the cholinergic system in the brain may be useful in treating Alzheimer’s disease and similar brain malfunctions. The herbs that inhibit Acetylcholinesterase (AchE) contain natural COX-2 inhibitors, also reported as medicinal herbs, for AD indication. Some ayurvedic herbs like Guduchi, Yashtimadhu, Padma (Nelumbo nucifera), Vacha, Convolvulus pluricaulis, Shankhpushpi, Pancha-Tikta-Ghruta Gugguli, Amalaki, Musta Arjun, Amalaki, Ashwagandha, Gulo Satva, Kutaj, and others are excellent herbs for slowing down the brain cell degeneration caused by Alzheimer’s. They enhance the brain’s ability to function, and therefore, provide stability when used consistently. Curcuma longa L. (Zingiberaceae) Curcuma longa (Turmeric, Harida) has been used as a source of Curcumin (diferuloylmethane), an orange-yellow component of turmeric or curry powder. Studies have proved that Curcumin has anti-inflammatory and antioxidant activities, and it helps in combating Alzheimer’s disease (AD). Regular consumption of this herb helps in keeping the mind balanced. [11] The dose of curcumin can be reduced by making it to colon targeting. [12] Bacopa monniera Wettst. (Scrophulariaceae) Goswami et al., evaluate the effect of Bacopa monnieri (Brahmi), associated with the Ayurveda system of medicine, on the cognitive functions in Alzheimer’s disease patients, and conclude that it could be beneficial in these patients, but more study is needed. [13] Centella asiatica L. (Umbelliferae) Extract from the leaves of Gotu Kola (Centella asiatica) has been used as an alternative medicine for memory improvement in the Indian Ayurvedic system of medicine for a long time. Ginkgo biloba L. (Ginkgoaceae) Ginkgo Biloba is the best known herb for Alzheimer’s disease and its associated symptoms. In controlled clinical trials, using a placebo and control group, ginkgo biloba extracts showed therapeutic benefits in Alzheimer’s, similar to prescription drugs such as Donepezil or Tacrin, with minimal undesirable side effects. [14] The chief chemical constituent of gingko

Citation: Ashwin Singh Chouhan. Ethanobotanical, Phytochemical, Pharmacological profile medicinal plants with the potential to treat Alzheimer’s disease and its complications. Jour of Clin Cas Rep, Med Imag and Heal Sci 4(51

DOI: 10.55920/JCRMHS.2023.04.001141
Ginkgo biloba is a potent antioxidant, with neuroprotective and cholinergic activities that help in the management of AD. Ginkgo biloba improves protection against Aβ protein-induced oxidative damages (degrading hydrogen peroxide, preventing lipid oxidation, and trapping the reactive oxygen species). [15] Ginkgo Biloba is best known for its ability to enhance circulation systemically. Its action is directly related to the vasorelaxing activity. Thus, Ginkgo Biloba can lower blood pressure and inhibit platelet aggregation. Scientific studies have shown its promise on cognition-enhancement (booster), if used during the early stages of Alzheimer’s disease. Salvia officinalis (Lamiaceae) Sage as it is more commonly referred for Alzheimer’s disease treatment. It has been reported to assist the brain in the fight against AD. Sage contains the antioxidants carnosic acid and rosmarinic acid. These compounds are thought to protect the brain from oxidative damage. [16] Rosmarinus officinalis (Lamiaceae) Rosemary (Satapatrika) contains the following natural COX-2 inhibitors: Apigenin, carvacrol, eugenol, oleenolic acid, thymol, and ursolic acid. ‘If a synthetic COX-2 inhibitor could prevent Alzheimer’s disease, so could a natural COX-2 inhibitor,’ according to Duke 2007. In addition, Rosemary contains nearly two dozen antioxidants and another dozen anti-inflammatory compounds. Some of the strongest antioxidant substances in the herb are carnosic acid and ferulic acid, which have even greater reported antioxidant activity than the widely common synthetic antioxidants butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA). [17] Rosemary can be used as a tea, in shampoo, or in bath water, because it can be absorbed through the skin.[18] Matricaria recutita (Asteraceae) German Chamomile is said to stimulate the brain, dispel weariness, calm the nerves, counteract insomnia, aid in digestion, break up mucus in the throat and lungs, and aid the immune system. Chamomile can relieve anxiety, and in higher doses, leads to drowsiness, according to the University of Maryland Medical Center. [19] Melissa officinalis L. (Lamiaceae) Historically, Melissa officinalis (lemmon balm) was believed to sharpen memory. Lemon balm can also temporarily improve cognitive decline as well as improve the mood for Alzheimer’s patients. Another study addressing the use of lemon balm for Alzheimer’s disease concluded that Melissa officinalis is one of several plants that may be useful in the prevention and treatment of Alzheimer’s disease due to its ability to inhibit acetylcholinesterase and its antioxidant activity. [19, 20] Glycerhiza glabra (Fabaceae) Alzheimer’s disease is characterized by neuronal loss and the presence of extracellular senile plaques, whose major constituent is amyloid-β peptide (Aβ). In this study, we investigated the effects of a water extract of licorice (Yashti-madhuka) on Aβ25-35-induced apoptosis in PC12 cells. Results suggest that GWE exerts a protective effect against apoptotic neuronal cell death induced by Aβ fragments. Extract from the licorice root is reported to treat or even prevent brain cell death in diseases like Alzheimer’s and its associated symptoms.[21] Galanthus nivalis L. (Amaryllidaceae) The chief chemical constituent of the Galanthus nivalis L. (common snowdrop) is Galanthamine, and this is an isooquinoline alkaloid. Acetylcholinesterase (AChE) inhibitors, which are also called ‘anticholinesterase drugs’, have been recently approved as an promising treatment approach for AD. Galanthamine has been found to be the long acting and specific inhibitor of the AChE enzyme and to potentiate cholinergic nicotinic neurotransmission by allosterically modulating the nicotinic acetylcholine receptors, which may be of additional value in the treatment of AD.[22,23] Huperzia serrata (Lycopodiaceae) Huperzia serrata (Thunb. ex Murray) is one of the genera in the Huperziaceae family (syn. Lycopodiaceae family). This genus, has been used for its memory-enhancing effect since ages in the Traditional Chinese Medicinal system (TCM), and is known to contain a large group of alkaloids called ‘Lycopodium alkaloids’. Huperzine A, a novel Lycopodium alkaloid extracted from Huperzia serrata, is well known as a reversible, potent, and selective AChE inhibitor. It is also known as ‘Qian Ceng Ta’in China, and Huperzine A has been used as a therapeutic agent for AD from centuries.[24] As reported by researchers, taking Huperzine-A leads to a significant improvement in memory, concentration, and the learning capacity. Research has also shown that Huperzine-A substantially reduces the abnormally high radical activity both in the brains of elderly animals as well as in the blood of Alzheimer’s patients. An experimental study in monkeys has shown that it reverses scopolamine-induced amnesia, suggesting that it may benefit the cognitive problems in Alzheimer’s patients or those with other cognitive disorders. [25] Commiphora whighitti (Burseraceae) Commiphora whighitti (Guggulu), a plant resin, contains the major constituent of guggulipid, which is guggulsterone. The guggulipid has been seen to be a potential cognitive enhancer for improvement of memory in scopolamine induced memory deficits. [26] Commiphora whighitti acts on impairment in learning and memory and decreased choline actyl transferase levels in hippocampus. However, Commiphora whighitti shows maximum effects on memory functions and the potential for dementia disorder. [27] Lipidium Meyenii Walp (Brassicaceae) Lipidium Meyenii (maca), is known as Maca. Maca shows beneficial improvement in memory and learning. Black maca improves experimental memory impairment, induced by ovariectomy, due in part, to its antioxidant and AChE inhibitory activities. Results demonstrated that black maca can enhance learning and memory in OVX (ovariectomized) mice and this effect might be related, at least in part, to its ability to reduce LPO (Lipid peroxidation) and AChE in OVX mice. [28] Panax Ginseng (Araliaceae) Panax Ginseng (Ren-
The breakdown of acetylcholine. The chief chemical constituents of Magnolia officinalis (talauma) is used as a traditional memory enhancing agent in Chinese medicine for the treatment of neurosis, anxiety, stroke, and dementia. [19] Acorus calamus L. (Araceae) Acorus Calamus (Sweet flag) (Araceae) possesses a beneficial memory enhancing property for learning and memory in normal and memory-deficits animals. Tinospora Cordifolia's mechanism for cognitive enhancement is by repairing the damaged neuronal networks. [19] Acorus Calamus inhibits the acetylcholinesterase (AChE). Acorus Calamus contains a majority of α-and β-asarone. [26] In the Ayurveda medicine system, Acorus Calamus has been used for the treatment of memory loss and its related symptoms. Acorus Calamus also shows anti-inflammatory, antioxidant, antispasmodic, cardiovascular hypolipidemic, immunosuppressive, cytoprotective, antiarrheal, antimicrobial, and anhelminthic activities. Angelica archangelica L. (Umbelliferae) Angelica archangelica L., also known as Dudhachoraa (Laghu Coraka), contains several substances that have the same kind of activity as drugs used for Alzheimer’s disease. These substances do not cause the side effects observed with drugs, such as, nausea, stomach ache, insomnia, and so on. The same phytochemicals in Angelica archangelica can also increase blood flow in the brain. A study shows that chloromethane sub-fraction of a methanol extract inhibit AChE in-vitro. [30, 31] Tinospora cordifolia (Menispermaceae) Tinospora Cordifolia (Guduchi) possesses a memory enhancing property for learning and memory in normal and memory-deficits animals. Tinospora Cordifolia’s mechanism for cognitive enhancement is by immunostimulation and synthesis of acetylcholine, this supplementation of choline enhances the cognitive function. [26] Magnolia officinalis (Magnoliaceae) The bark of Magnolia Officinalis (talauma) is used as a traditional memory enhancing agent in Chinese medicine for the treatment of neurosis, anxiety, stroke, and dementia. Magnolia Officinalis inhibits the memory impairment induced by scopolamine through the inhibition of AChE. The ethanolic extracts of M. officinalis, magnolol and honokiol, are reported to have antioxidant activity in vitro and in vivo. [26, 31] Collinsonia canadensis (Lamiaceae) Horsebalm (Monarda) has been reported to prevent the breakdown of acetylcholine. The chief chemical constituents of horsebalm are carvacrol and thymol which are used for AD. Normally our body’s protective blood–brain barrier helps prevent harmful substances in the blood from reaching the tissues of the brain. However, it can also prevent helpful medicines from reaching the brain. The horsebalm compounds seem to cross that great divide. Horsebalm is even used as a herbal shampoo by adding a few drops to your normal herbal shampoo. [18] Berthaollettia excelsa (Lecythidaceae) although the name is Brazil Nuts, the most significant exporter of Brazil nuts is not Brazil, but Bolivia. In Brazil these nuts are called castanhas-do-Para. [32] It has a high concentration of lecithin, which contains choline. Choline is a building block for acetycholine. These building blocks enhance the concentration of acetylcholine in AD patients. Other plants that contain good amounts of lecithin are dandelion flowers, poppy seeds, soybeans, mung beans, horseradish, ginseng, cowpeas, English peas, and lentils. [18] Urtica dioica L. (Clusiaceae) Stinging Nettle has been used for centuries to treat allergy symptoms, particularly hayfever, which is the most common allergy problem. It contains biologically active compounds that reduce inflammation. It contains the mineral boron that is reported to enhance the levels of estrogen, which is a hormone in the body, which can be beneficial in short term memory. Stinging nettle has also been shown to elevate the mood in some Alzheimer’s patients. [18,32] Withania somnifera (Solanaceae) Active glycowithanolides of Withania somnifera (Ashwagandha) have a significant antioxidant function, which is accomplished by increasing the activities of superoxide dismutase, catalase, and glutathione peroxide. [33] Ashwagandha is also reported as a Nervine tonic that rejuvenates the cells and boosts energy. The assessment of cholinesterase inhibition was carried out using a colorimetric method based on Ellman’s reaction and demonstrated that the W. Somnifera extract significantly inhibited AChE in a concentration-dependent manner.

The most common medicinal herbs for the treatment of AD and those reported in literature are Ginkgo biloba L. (Ginkgoceae), Salvia officinalis L., and Huperzia serrata Thunb. (Lycopodiaceae). Some others are medicinal herbs that have a beneficial effect in the treatment of Alzheimer’s disease (AD) and its associated symptoms are: Acorus calamus L. (Araceae), Angelica archangelica L. (Umbelliferae), Bacopa monniera Wettst. (Scrophulariaceae), Biota orientalis L. (Coniferae) Cupressaceae, Celastrus paniculatus Wild. (Celastraceae), Centella asiatica L. (Umbelliferae), Cittoria ternata L. (Leguminosae), Codonopsis pilosula Franch. (Campanulaceae), Convolvulus pluricaulis Chois. (Convolvulaceae), Coptis chinensis Franch. (Ranunculaceae), Crocus sativus L. (Iridaceae), Curcuma longa L. (Zingeberaceae), Ecdida rutacearpa (Juss.) Benth. (Rutaceae), Ginkgo biloba L. (Ginkgoaceae), Hypericum perforatum L. (Clusiaceae) (Hypericaceae) Magnolia officinalis Rehd. and Wils. (Magnoliaceae), Melissa officinalis...
L. (Lamiaceae), Piper methysticum Frost. (Piperaceae), Polygala tenuifolia Wild. (Polygalaceae), Rheum spp. L. (Polygonaceae), Salvia lavandulaefolia Vahl. (Lamiaceae), Salvia miltiorrhiza Bung. (Lamiaceae), Salvia officinalis L. (Lamiaceae), Terminalia chebula L. (Combretaceae), Withania somnifera L. (Solonaceae), and so on.

**Result**

Herbs may play a promising role in the early treatment of Alzheimer’s and other conditions involving poor memory and dementia. One of the chief benefits is that they have a low toxicity compared to pharmaceutical agents. There is no reason why botanicals cannot be used adjunctively with drugs, or other complementary approaches such as SAMe, fish oil, and antioxidant vitamins. A review of the literature indicates that the sooner the treatment is started, the better will be the outcome. Therefore, if clients have family members with a history of Alzheimer’s disease, or other states involving poor memory, they may start taking these remedies prior to the onset of symptoms, to delay or possibly prevent the advent of the symptoms. The acorus/ginkgo formula mentioned earlier (with salvia and ginkgo) and vinpurazine with naturally extracted huperzine A are two promising long-term therapies for people suffering from memory loss, dementia, and Alzheimer’s disease.

**Conclusion**

The use of herbal medicines in the treatment of AD should be compared with the drug treatment currently being used. Such studies should include active ingredient identification to improve clinical trial validation. Further large-scale multicenter studies are needed to determine the effectiveness of these agents in the cognitive impairment of AD. To date, this review provides evidence of the benefit of many herbs (included in the Indian System of Medicine, Chinese Medicine System, European System of Medicine, etc.) in the treatment of AD.

**Acknowledgment:** We grateful thanks to all the sincere and extremely helpful friends for their support and help for the completion of work. Last but not the least, we thankful to all those who cooperated and helped me directly or indirectly to carry out this work.

**Ethical Approval:** Ethical approval was not required for this letter. All data used is publicly accessible.

**Funding:** - There were no external sources of funding for this research.

**Data Availability Statement:** We do not wish to share our data before we have thoroughly analyzed. All data sources described in the study are directed at the corresponding author.

**Financial Support and Sponsorship:** Nil.

**Conflicts of Interest:** All authors are declaring that they have no conflicts of interest.

**Authors’ Contribution:** The first author developed the proposal, and then collected and analyzed the data under supervision of respective advisers. The rest of authors undertook the literature search and review, and gave constructive comments and guidance to work with the main author with respect to the research objective.

**References**


