

Medicinal Plants for Improving Cognitive Function: A Review

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Abstract

Background: Cognition is critical for functional independence as people age. Neurodegenerative dementias are more likely to affect older adults due to the aging process. The inadequate response of conventional therapeutic approaches, besides numerous side effects, can cause patients to explore complementary and alternative medical options. This study aimed to introduce the most common medicinal herbs used in Persian medicine for the prevention and treatment of cognitive impairments.

Methods: In order to identify medicinal herbs for the treatment and prevention of cognitive diseases, manuscripts were searched by keywords such as “Nesyan”, “Fesad-al-Zekr”, and “Zekr”. Afterwards, the scientific names and pharmacological properties of selected plants were also searched in scientific databases such as PubMed, Scopus, and Web of Science.

Results: The results of the review indicate that herbal remedies could be effective in treating cognitive impairment and dementia. The neuroprotective, antioxidant, and acetylcholinesterase inhibitory activities are the basis for how these remedies work.

Conclusion: The neuropharmacological effects of medicinal plants on numerous pathways make them promising candidates for future drugs or adjunct therapies in combination with established pharmaceuticals; however, further clinical research is required to establish the safety and effectiveness of these treatments.

Keywords: Medicinal plants, Cognition, Review

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Introduction

Owing to the improvement of health care in the last decades, the number of the elderly has increased in most societies.¹ Among other common diseases in individuals aged 65 years and above, cognitive impairment is one of the most prevalent dysfunctions. It is a neurodegenerative disorder that affects different abilities such as memory, language, attention, and executive functioning.² Neurodegenerative and vascular diseases, and dysthymia or dysphoria can result in memory impairment and are usually a sign of dementia. The age-adjusted prevalence of dementia in the Middle East and North Africa region was 777.6 per 100 000 people in 2019, representing an increase of 3% compared to 1990.³ According to various surveys, the prevalence of the disease varies in different populations. The prevalence of Alzheimer's disease and mild cognitive impairment in the elderly aged 65 years and

above was reported to be 11.3% and 22.7%, respectively.⁴ It is predicted that the number of individuals with memory impairment will double by 2040 in developing countries.⁵ The disease not only reduces life satisfaction in patients but also imposes a huge burden on society and health care. Considering the rapid growth in the prevalence of the disease and problems that are imposed on both patients and society, the development of new methods of treatment and prevention seems necessary.⁶ There is currently no cure for dementia but certain medications can help manage symptoms of the disease and slow down the worsening of symptoms. Even though the drugs used for the treatment of cognitive impairment are generally well tolerated, with common side effects being nausea, diarrhea, and vertigo, there is a requirement for more alternative drugs that have fewer side effects and focus on the underlying neurobiological mechanisms.⁷



Numerous herbal remedies have been used in the prevention and treatment of cognitive impairment in traditional medicine.⁸ Recently, different studies have evaluated the efficiency of herbal remedies in treating chronic neurodegenerative disorders. The current study introduces the most common medicinal herbs for the prevention and treatment of memory impairment in Persian Medicine. Furthermore, this study supports the evidence of pharmacological properties of recommended herbs.

Materials and Methods

Ghanoon fel-teb, Gharabadin Kabir, and Exir-e-Azam are the main Persian traditional medicine references. These books have been taught in European medical schools for centuries. Manuscripts authored by eminent scientists across centuries were chosen. The selected books were searched using keywords such as “Nesyan”, “Fesad-al-Zekr”, and “Zekr” to find the related medicinal herbs for the treatment and prevention of diseases related to cognition. After gathering the data from old manuscripts, the scientific names and pharmacological properties of selected plants were also searched in scientific databases such as PubMed, Scopus, and Web of Science.

Studies that explored the use of plants for the prevention and treatment of cognitive impairment (animal, human, and in vitro) and were published in authentic journals were selected. Research articles from journals with uncertain validity or without a clear research strategy were excluded from the study (Table 1).

Lavandula angustifolia

Lavandula angustifolia, native to the Mediterranean area, belongs to the *Lamiaceae* family. Different parts of the plant such as leaves and flowers either in the form of oil or other extracts are used as therapeutic agents in Traditional Medicine. Besides the sedative, anticonvulsant, analgesic, and local anesthetic effects, the aqueous extract of the plant has beneficial impacts on memory (Lavender). Caffeic acid and luteolin-7-glycosid are the two constituents of the aqueous extract of lavender that are potentially effective in reducing oxidative stress and inflammatory response; therefore, this plant can be useful in the treatment of neurodegenerative diseases.⁵⁴ Based on the results of a study conducted in China, lavender was efficient as an adjunct treatment in relieving agitated behaviors of Chinese patients who suffered from dementia. Therefore, among the patients that are particularly vulnerable to side effects of psychotropic medications, alternative solutions such as aromatherapy by lavender could be a good choice for both patients and clinicians.⁵⁵

Ferula assa-foetida

Ferula assa-foetida is an herbaceous perennial plant of the *Apiaceae* family that grows widely in the central and southern mountains of Iran. Asafoetida is an oleo-gum-resin obtained from the exudates of the roots of the *F.*

assa-foetida. Because of its sulfurous odor and bitter taste, it is used as a flavoring spice in Iranian cuisine. This plant has been reported to be beneficial for the brain and nerves due to inhibition of AChE activity that results in the improvement of memory and learning. The secondary metabolites in plant extracts are able to increase the amount of acetylcholine in the brain so it can alleviate the symptoms of neurological dysfunction in individuals with Alzheimer’s disease or dementia.⁵⁶

Terminalia chebula Retz

Terminalia chebula Retz, known as black myrobalan, is a medicinal plant whose different parts such as fruit, bark, and root are used in the treatment of various ailments. The plant belongs to the *Combretaceae* family. Based on the findings of several surveys, the fruits of the plant are useful in the improvement of memory loss and cognitive deficits. Additionally, *T. chebula Retz* contains large amounts of active compounds which have beneficial effects on Alzheimer’s disease.⁵⁷

Allium sativum L.

Allium sativum L., known as garlic, is one of the most common herbs used both as flavor and medicine since ancient times. According to different studies, it has anti-amyloidogenic, anti-oxidant, and acetylcholine activities, which can prevent common age-related diseases.⁵⁸

Melissa officinalis

Melissa officinalis, which is commonly referred to as “lemon balm” due to its lemon-like flavor and fragrance, is a member of the *Lamiaceae* family. The plant has been used as medicine traditionally in many parts of the world. Among its various functions, the anti-depressant effect is of considerable interest.⁵⁹ The terpenes, esters and aldehydes present in the lemon balm produce antioxidant and sedative effects. The essential oil of the plant has been traditionally used for relieving distress and anxiety for centuries.⁶⁰

Thymus vulgaris

Thymus vulgaris is a flowering plant that is native to southern Europe from the western Mediterranean to southern Italy and belongs to the *Lamiaceae* family. The plant not only is used as medicine but also as a culinary ingredient and aroma. Due to its antioxidant and acetylcholinesterase inhibitory effects, it is useful in the treatment of dementia.⁶¹

As mentioned before, the best therapeutic approach for the treatment of dementia is the inhibition of AChE. Based on the results of several surveys, *Thymus vulgaris* had a neuroprotective effect on scopolamine-induced memory impairment in zebrafish. It can be concluded that the plant has an important role in improving the cholinergic nervous system and antioxidative stress. Therefore, it can be a good alternative approach for the treatment of cognitive dysfunction.²⁰

Table 1. Pharmacological Properties of Most Important Medicinal Plants Used for the Treatment of Dementia in TPM

Scientific Name of the plant	Traditional Name	Part Used	Pharmacological Effect	Dose	Animal/in vitro/RCT	Reference
<i>Lavandula angustifolia</i>	Ustukhuddus	Arial part	Neuroprotective, anti- Alzheimer, antioxidant, antispasmodic, and acetylcholinesterase inhibitory effects	1-2 g	Animal/in vitro/RCT	9,10
<i>Ferula assa-foetida</i>	Anjedan	Seed	Acetylcholinesterase inhibitory effect and antioxidant properties	200-500 g	Animal/in vitro	11,12
<i>Terminalia chebula Retz</i>	Halileh kaboli	Fruit	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	500-1500 g	Animal/in vitro	13,14
<i>Allium sativum L.</i>	Som	Bulb	Anti-amyloidogenics, antioxidant, and acetylcholinesterase inhibitory effects	300-1000 g	Animal/in vitro/RCT	15,16
<i>Melissa officinalis L.</i>	Badranjbuyeh	Aerial part	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	1-2 g	Animal/in vitro/RCT	17,18
<i>Thymus vulgaris</i>	Hasha	Leaf	Neuroprotective, antioxidant, and acetylcholinesterase inhibitory effects	3-4 g	Animal/in vitro/RCT	12,19,20
<i>Peganum harmala L.</i>	Harmal	Seed	Cerebroprotective effect, acetylcholinesterase inhibitory effect, suppressing lipid peroxidation, augmenting endogenous antioxidant enzymes, and reducing acetylcholinesterase activity in the brain ²¹	2-4 g	Animal/in vitro	11,12
<i>Pimpinella anisum L.</i>	Anisun	Fruit	Neuroprotective and antioxidant effects and reducing both AChE and oxidative stress	1-1.5 g	Animal/in vitro	22,23
<i>Rosa damascena</i>	Gol-e Sorkh	Flower	Antioxidant effect, induce neurogenesis, synaptic plasticity, improve memory improve significantly the levels of acetylcholinesterase enzymes and the rate of stress indicators, and improving the level of consciousness and brain function	1.5 g	In vitro	24,25
<i>Hyssopus officinalis L.</i>	Zofa	Arial part	No significant acetylcholinesterase inhibitory effect, antioxidant effect	450-900 g	Animal/in vitro	26,27
<i>Pistacia lentiscus L.</i>	Mastaki	Gum	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	200 g	Animal/in vitro	28,29
<i>Piper nigrum L.</i>	Felfel	Fruit	Neuroprotective, anti- Alzheimer, and antioxidant effects, reducing AChE activity	4.5 g	Animal/in vitro	30-32
<i>Anacyclus pyrethrum L.</i>	Aghergherha	Root	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	0.5-1 g	Animal/in vitro	33,34
<i>Acorus calamus L.</i>	Vaj	Root	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	4.5 g	Animal/in vitro	35,36
<i>Crocus sativus L.</i>	Zaferan	Stigma	Neuroprotective, anti- Alzheimer, and antioxidant effects	20-400 mg	Animal/in vitro/RCT	37-39
<i>Teucrium polium L.</i>	Jade	Leaf	Anticonvulsant, antioxidant, anti-Alzheimer, and anti-inflammatory activities	250 mg	Animal/in vitro	12,40
<i>Cinnamomum verum</i>	Darchin	Stem bark	Neuroprotective, anti- Alzheimer, and antioxidant activities	2.5 g	Animal/in vitro	29,41
<i>Zingiber officinale Rosc</i>	Zanjabil	Rhizome	Anti-inflammatory, anti-apoptotic, neuroprotective, anti-Alzheimer, and antioxidant activities	70-140 mg	Animal/in vitro	42-44
<i>Boswellia carterii</i>	Kondor	Oleo-gum-resin	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	300-400 mg	Animal/in vitro	29,45,46
<i>Piper longum</i>	Darfilfil	Fruit	Neuroprotective, anti- Alzheimer, and antioxidant activities	0.5-1 g	Animal/in vitro/RCT	47,48
<i>Cyperus rotundus.</i>	So'd	Tuber	Neuroprotective effects such as neurogenesis and neuronal regeneration that improve learning and memory performance, anti-Alzheimer activity, and antioxidant activity	3-6 g	In vitro	49,50
<i>Phyllanthus emblica L.</i>	Amele	Fruit	Neuroprotective, anti- Alzheimer, antioxidant, activities, decrease in the level of AChE activity	250-500 g	Animal/in vitro	45,51
<i>Asarum europaeum</i>	Osaron	Rhizome	Neuroprotective, anti- Alzheimer, antioxidant, and acetylcholinesterase inhibitory effects	4.5 g	In vitro	45,52
<i>Terminalia bellirica</i>	Balile	Fruit	Neuroprotective, anti- Alzheimer, and antioxidant activities	500-1500 mg	Animal/in vitro	13
<i>Vitis vinifera</i>	Zabib	Fruit	Neuroprotective, anti- Alzheimer, and antioxidant activities	4-18 mL	Animal/in vitro/RCT	53

Peganum harmala L.

Peganum harmala L. is a perennial herb whose seeds and aerial parts have been used as medicine in China for the treatment of various diseases such as forgetfulness

for centuries. In a study, Liu et al demonstrated that different parts of the plant are used for treating cognitive dysfunctions such as Alzheimer's disease.⁶²

The two β -carboline alkaloids, harmine and harmaline,

are responsible for AChE inhibition. In summary, the plant extract may have a significant role in the prevention of dementia. The inhibition of oxidative stress increases the activity of antioxidant enzymes which results in improvement of enzyme activities in the brain.¹¹

***Pimpinella anisum* L.**

Pimpinella anisum L. is a medicinal plant that belongs to warm regions like India, Iran, and Egypt. Different studies have shown that the plant has therapeutic effects on several ailments such as neurologic disorders.

According to the reports of different studies, there are several mechanisms like scavenging free radicals and neuroprotection that are caused by inhibition of acetylcholinesterase in brain cells and result in antiamnesic action.^{63,64}

Rosa damascena

Rosa damascena is a bushy shrub with colorful flowers used in different industries such as perfume, food, and medicine. The origin of the plant is the Middle East but it is cultivated all over the world. The medicinal function of the plant is attributed to the presence of phenolic compounds that have anti-oxidant activity which improves memory and brain function.⁶⁵

***Hyssopus officinalis* L.**

Hyssopus officinalis L. belongs to the *Lamiaceae* family and is distributed from the East Mediterranean to Central Asia. *Hyssopus officinalis* has been used as a medicinal remedy for a long time in different nations. One of the activities of *H. officinalis* proved by surveys is its antioxidant function.⁶⁶

***Pistacia lentiscus* L.**

Pistacia lentiscus L. is a member of the *Anacardiaceae* family. The most commonly used part of the plant is resin which is known as Mastic resin and exudes from the bark. The plant has antiatherogenic, antimicrobial, antioxidant, hepatoprotective, antiarthritic, wound healing, and anticancer properties.⁶⁷

***Piper nigrum* L.**

Piper nigrum L., known as pepper, is the most commonly consumed spice in the world. Almost all parts of the plant such as flower, seed, leaf, and fruit are used for managing different ailments. According to different *in vitro* and *in vivo* studies, the fruit of the plant ameliorates memory impairment by attenuating oxidative stress in rat hippocampus.⁶⁸

***Anacyclus pyrethrum* L.**

Anacyclus pyrethrum L., a plant native to Asian countries such as India, belongs to the *Asteraceae* family. The roots of the plant are used for therapeutic purposes. Based on the reports of various surveys, the plant has memory-enhancing activity and is efficient in the

treatment of impaired cognitive functions.⁶⁹ The results of a study demonstrated that the ethanolic extract of *A. pyrethrum* has memory-enhancing effect by increasing cholinesterase level in the brain. Therefore, it improves cognitive processes.⁷⁰

***Acorus calamus* L.**

Acorus calamus is a medicinal herb from the *Acoraceae* family. The rhizome of the plant when dried and powdered has a spicy flavor. Rhizome and leaves of the plant have also been used as medicine traditionally.

***Crocus sativus* L.**

Crocus sativus L., known as Saffron, is widely cultivated in Iran and other countries such as India and Greece. Saffron has been traditionally used for the treatment of different diseases like depression.⁷¹ The pistil of the plant is useful in the treatment of mental illnesses and improvement of memory.⁷² *Acorus calamus* reduces oxidative damage induced by scopolamine, thereby restoring the brain's antioxidant state. Therefore, it may be an efficient therapeutic option for the treatment and prevention of neurodegenerative disorders like dementia and Alzheimer's disease.^{73,74}

***Teucrium polium* L.**

Teucrium polium L., a member of the *Lamiaceae* family, can be found abundantly in Iran and grows wild. Among different properties of the plant such as hyperglycemic and insulinotropic activities, some reports have demonstrated the antioxidant effect of the herb as well.⁷⁵ Results show that *T. polium* is rich in essential minerals like calcium, sodium, magnesium, and so on. Moreover, the phenolic compounds of the plant have antioxidant, antihyperglycaemic, anti-Alzheimer, and anti-inflammatory properties. Therefore, it can be a good candidate for alleviating different health-debilitating problems.⁴⁰

Cinnamomum verum

Cinnamon (*Cinnamomum verum*), grown in Sri Lanka and Southern India, is a traditional herb with various health benefits that has been used for the treatment of different ailments.⁷⁶ Research has demonstrated that cinnamon has been traditionally utilized for age-related brain disorders. Potent BChE inhibitory activity of cinnamon can be considered in the management of advanced Alzheimer's disease (AD). The polyphenolic compounds in the aqueous extract of cinnamon are responsible for its predominant antioxidant activity.⁴¹

***Zingiber officinale* Rosc.**

Ginger, which is botanically known as *Zingiber officinale* Roscoe, is a medicinal herb from the *Zingiberaceae* family. The phenolic compounds of ginger such as gingerols and shogaols are the primary agents responsible for the health benefits of ginger.⁷⁷ The antioxidant and

anti-acetylcholinesterase activities of ginger have been studied for the effectiveness of ginger in preventing and treating degenerative diseases, including Alzheimer's disease.⁴² Studies have shown that ginger can hinder the progression of dementia in all stages, neurodegeneration and neuroinflammation, and simultaneously maintain the survival of neurons.⁴²

Boswellia carterii

Boswellia carterii, known as Kondor, or Frankincense gum resin, is used in traditional medicine in India and Iran.⁷⁸ It is a valuable substance used in traditional medicine for its effect on the improvement of memory and learning. Avicenna, a Persian physician, proposed that *B. carterii* could improve memory function and prevent amnesia in the elderly.⁷⁹ The anti-oxidative, anti-inflammatory, and anti-diabetic properties, as well as its inhibitory effects on AChE and anti-A β activities, with its effects on the modulation of Tau deposition and hyperphosphorylation in the brain, make it a potent multi-targeting agent.⁷⁸

Piper longum

Although *Piper longum* is mostly used as a spice in cooking, several studies have proved the efficacy of the plant in the treatment of many diseases. Among various properties of the herb, its therapeutic potential for Alzheimer's disease is noticeable. A survey conducted by Joen et al demonstrated that the mixture of two ingredients, piperlonguminine and dihydropiperlongominine, can control the expression of amyloid precursor protein which is helpful in managing the patients with Alzheimer's disease.⁸⁰

Cyperus rotundus

Cyperus rotundus belongs to the Cyperaceae family and due to its adaptability to wide range of climate and soil conditions, it can be cultivated in many parts of the world. Many studies revealed the antioxidant activity of the herb which is beneficial for managing loss of memory.⁸¹ The bioactive compounds of the plant such as phenolics and flavonoids are responsible for its antioxidant and anti-apoptotic activities.⁸²

***Phyllanthus emblica* L.**

Phyllanthus emblica is widely distributed in tropical areas such as Malaysia, India, Indonesia, and China. The delicious fruit of the plant is a great source of vitamin C and superoxide and has been traditionally used as medicine. Based on reports provided by different surveys, the phenolic compounds of the plant act as antioxidants and protect cells from the oxidation caused by free radicals. Free radicals are among the main causes of some neurodegenerative diseases.⁸³

Asarum europaeum

Asarum europaeum L. is a member of the *Aristolochiaceae* family. The plant has been used as a medicinal remedy for centuries in many countries. In Persian traditional

medicine, the rhizome of the plant has been used for the treatment of memory impairment. The results of the study conducted by Limon et al demonstrated that the neuroprotectivity of the components against A β in the hippocampus resulted in a significant improvement in spatial memory in rats.⁵²

Terminalia bellirica

Terminalia bellirica belongs to the *Combretaceae* family. This large tree is widely distributed in many parts of the world, especially in the Indian subcontinent and South East Asia. Oxidative stress is associated with many disorders in humans. Antioxidants inhibit or reduce the reaction of free radicals that protects cells against damage.⁸⁴ Several studies have reported the antioxidant activity of the plant, which is attributed to the presence of large amounts of phenolic and flavonoid components in the plant.⁸⁵

Vitis vinifera

Vitis vinifera is a well-known grape species of the Vitaceae family. There are seedless and non-seedless varieties in red, black, and white colors. It can be found in Western Asia and Southern Europe. All parts of the plant such as roots, stems, leaves, fruits, seeds, cane, and pomace contain different phytochemical substances. The ethanol extract of grape seeds has the antioxidant activity.⁸⁶ According to the results of a previous study, polyphenols derived from grapes have anti-oxidative, anti-inflammatory, and anti-amyloidogenic activities. Therefore, it can be considered a potential candidate for counteracting the multifactorial nature of Alzheimer's disease.⁸⁷

Discussion

As mentioned before, cognitive impairment/dementia is one of the most serious dysfunctions with a high prevalence among the elderly. Dementia is a neurodegenerative disorder that is chronic and progressive in nature. Several functions such as thinking, judgement, comprehension, learning, and calculation can be impaired by the disease.

The categorization of different types of cognitive impairment or dementia dates back to AD 1025 when Avicenna described the disease in his medical masterpiece "Canon of Medicine". Ibn Sina, known as Avicenna, was born on August 23, 980, in a small city of Iran, Afshaneh. His great talent for learning made him a genius in many subjects such as mathematics, astronomy, geometry, and theology when he was just a child. By the age of 17, he found medicine appealing and started the practice of medicine.⁸⁸ Qanun fi Al-Tibb was his encyclopedia of medicine and it overshadowed all previous medicinal books when appeared.⁸⁹ It became an important reference book in many universities of the West and was translated into many languages such as Latin, German, French, and so on.

Generally, cognitive impairment is defined as "Nesyan" in the third volume of Canon of Medicine. According to

Table 2. The Most Important Activities of the Introduced Remedies

Mechanism	Name of the plant
Neuroprotective activity	<i>Lavandula angustifolia</i> , <i>Terminalia chebula</i> Retz, <i>Melissa officinalis</i> L., <i>Melissa officinalis</i> L., <i>Thymus vulgaris</i> , <i>Pimpinella anisum</i> L., <i>Pistacia lentiscus</i> L., <i>Piper nigrum</i> L., <i>Anacyclus pyrethrum</i> L., <i>Acorus calamus</i> L., <i>Crocus sativus</i> L., <i>Cinnamomum verum</i> , <i>Zingiber officinale</i> Rosc, <i>Boswellia carterii</i> , <i>Piper longum</i> , <i>Piper longum</i> , <i>Cyperus rotundus</i> , <i>Phyllanthus emblica</i> L., <i>Asarum europaeum</i> , <i>Terminalia bellirica</i> , <i>Vitis vinifera</i>
Antioxidant activity	<i>Lavandula angustifolia</i> , <i>Ferula assa-foetida</i> , <i>Terminalia chebula</i> Retz, <i>Allium sativum</i> L., <i>Melissa officinalis</i> L., <i>Thymus vulgaris</i> , <i>Peganum harmala</i> L., <i>Rosa damascene</i> , <i>Pimpinella anisum</i> L., <i>Hyssopus officinalis</i> L., <i>Pistacia lentiscus</i> L., <i>Piper nigrum</i> L., <i>Anacyclus pyrethrum</i> L., <i>Acorus calamus</i> L., <i>Crocus sativus</i> L., <i>Teucrium polium</i> L., <i>Cinnamomum verum</i> , <i>Zingiber officinale</i> Rosc, <i>Boswellia carterii</i> , <i>Piper longum</i> , <i>Cyperus rotundus</i> , <i>Phyllanthus emblica</i> L., <i>Asarum europaeum</i> , <i>Terminalia bellirica</i> , <i>Vitis vinifera</i>
Acetylcholinesterase inhibitory effect	<i>Lavandula angustifolia</i> , <i>Ferula assa-foetida</i> , <i>Terminalia chebula</i> Retz, <i>Allium sativum</i> L., <i>Melissa officinalis</i> L., <i>Thymus vulgaris</i> , <i>Peganum harmala</i> L., <i>Rosa damascene</i> , <i>Pistacia lentiscus</i> L., <i>Anacyclus pyrethrum</i> L., <i>Acorus calamus</i> L., <i>Asarum europaeum</i>

him, different brain damages are caused by changes in brain temperament.

There are three main approaches to the treatment and prevention of ailments in traditional medicine:

- Lifestyle modification
- Manipulation
- Consumption of herbal remedies

Lifestyle Modification

According to Avicenna, the main goal of medicine is to maintain the well-being of individuals or return it when an illness occurs. Avicenna was the first scholar who explained the important factors associated with lifestyle.⁹⁰ The six principles of lifestyle modification include:

- Climate
- Mental movement and repose
- Sleep and wakefulness
- Foods and drinks
- Excretion of unnecessary substances and retention of necessary ones
- Body movement and repose

Manipulation

Manual therapy is the next step towards the treatment of diseases in traditional medicine. It has different types and indications. Massage is one form of manual intervention used by many scholars of traditional medicine.⁹¹

Herbal Remedies

Medicinal plants are precious sources of natural components that have been proven to play important roles as natural pharmaceutical agents. The use of plants as medicine dates back to the beginning of life on the earth by mankind. Various pharmacological studies and clinical trials have reported the efficacy of herbal remedies in the prevention and treatment of neurodegenerative disorders like cognitive impairment and dementia. It can be concluded that leaves are the most common part of the plant used for the treatment of cognitive impairment. However, it should be mentioned that other parts of the plants like rhizome, fruit, and seed are efficient in the prevention and treatment of the disorder as well. Based on the results of various surveys, several efficient mechanisms for memory improvement have been reported.

The most notable properties of the introduced remedies have been categorized in Table 2.

Conclusion

Based on the significance of chronic diseases like cognitive impairment and dementia and considering the high costs of treatment and the burden on both the healthcare system and society, it seems that further investigations are necessary as these remedies are natural and easy to use.

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Not applicable.

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