

Nutritional Neurosciences

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Role of Nutrients in Neurological Disorders

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Chapter 11

Natural Foods for Suppressing Dementia

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Abstract Memory loss and problems with thinking, solving, or language are symptoms of “dementia.” These variations are usually slight, but for one having this disability will become serious and affect daily life. This is a common clinical condition that shows advancements gradually over years. Many people who are affected by this are disabled not only by cognitive impairment then again also by common connected diseases of advanced years such as stroke, arthritis, and heart disease. The overburden of dementia on patients, careers, and the health system is large, and there are chances of increase as populations grow older. Dementia has gained an increasing public health concern and is likely to continue through this path even though it has smaller amount of risk factors. This article is to highlight many other related diseases that result in dementia and some of the natural remedies that will help in suppressing dementia and also some of the new methods to develop novel therapies.

Keywords Dementia · Symptoms · Types · Diagnosis · Natural remedies

11.1 Introduction

World Health Organization (WHO 2017) in its description says that dementia is a term used for group of diseases affecting memory, cognitive abilities, and behavior that affect the ability to maintain daily living activities. Although age is considered to be the strongest risk factor, it is not a normal part of aging. Two or added brain functions like memory and language complications are found with individuals with dementia. The disease is often long term, but has slow decrease in cognitive abilities, lack of motivation, memory loss, emotional and language complications. Furthermore memory loss is not a common symptom of dementia. It is not a part of aging

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even though the disease is commonly seen among aged people (Bathgate and Scotland 2015). Numerous cognitive abilities can be compared with dementia which includes memory, language, thinking, decision making, visuospatial function, attention as well as orientation. In people with dementia, cognitive impairments often go with changes in personality, emotional regulation, and social behaviors. The cognitive and behavioral changes that occur with dementia impede work, social activities, and bonding and impair a person's ability to perform daily activities like driving, housekeeping, cooking, taking care of finances and personal care (Gilman 2010; McKhann et al. 2011).

Widespread diseases such as Alzheimer's disease (AD), front temporal dementia (FTD), Lewy body dementia (LBD), vascular dementia (VD), syphilitic dementia (SD), mixed dementia (MD), senility dementia (SD), or the combined effect of two or more dementia types, and even stroke are known to cause dementia. Some of the symptoms of the above said diseases can be cured by drugs but not the diseases themselves. These drugs only aggravate the symptoms or foremost slow down the disease rather than curing it or repair brain damage. Indeed, there is no known cure for dementia (Fymat 2018a, b, c, d).

11.2 Types

Common types of dementia are discussed below:

11.2.1 Alzheimer's Disease

It is said to be the most common cause of dementia where an abnormal protein is found surrounding the brain cells and one more protein damaging their internal structure. Within the stipulated time, the chemical connections between cells in brain are lost and cells ultimately begin to die.

Symptoms: Problems like remembering the daily activities are often the first thing to be observed, then certain kind of difficulties like finding the right words, solving problems, making decisions, or recognizing things in three dimensions is also observed in addition.

11.2.2 Vascular Dementia

Here occurs narrowing or blockage of blood vessels because of which oxygen supply to the brain is reduced and some of the brain cells become damaged or die. This can also be triggered by disease known as subcortical vascular dementia which affects the small blood vessels deep in the brain.

Symptoms: Series of small strokes for a longer period of time can lead to vascular dementia, and other symptoms include struggling with problem-solving or planning, thinking speedily, and focusing which may overlap with those of Alzheimer's disease.

11.2.3 *Mixed Dementia*

Accumulation of abnormal proteins occurs, and the person may have noticeable changes in the brain which is linked to Alzheimer's disease, vascular and Lewy body dementia. Symptoms may vary, depending on changes in the brain and the area that is affected.

11.2.4 *Dementia with Lewy Bodies*

Chemistry of the brain cells is destroyed by the formation of tiny abnormal structures known as Lewy bodies inside the brain cells. It is found to be one of the reasons leading to the death of brain cells.

Symptoms: Early symptoms can have many variations which include lack of attentiveness that has fluctuations throughout the day, hallucinations, and also trouble in judging distances. These symptoms are found to be closely related to Parkinson's disease that also shows some difficulty with action.

11.2.5 *Front Temporal Dementia (Including Pick's Disease)*

The front and side parts of the brain are damaged because of clumps of abnormal proteins that are formed inside brain cells, causing them to die. Because of this there are certain changes at first noted in personality and then in behavior.

Symptoms: Person may have difficulties with communication or forget the meaning of words that clearly depend on which part of the brain is being damaged (Alzheimer's Society 2017).

11.3 Signs and Symptoms

The signs and symptoms follow the three phases given below and the diagnosis is entirely different from prior mental functioning with much difference than would have been projected due to aging.

11.3.1 *Early Phase*

Slow and often ignored with common symptoms which include forgetfulness, space, and time confusion.

11.3.2 *Middle Phase*

As there is a progression in disease, it shows clear and more restricting symptoms that include need for help, having balance problems, tremors, difficulties in eating and swallowing, speech and language difficulties, behavioral changes like wandering, restlessness, repeated questioning, forgetting recent events, and other difficulties that include lack in communication, attention, problem-solving, and memory misrepresentations that include remembering sequence of events, combination of memories, confusion of people, etc.

11.3.3 *Late Phase*

Severe memory disturbances which include not recognizing relatives and friends, greater physical difficulties, near total dependence and inactivity, aggressiveness, crying, anger that comes under behavioral changes, unawareness of time and space. Serious changes in behavioral and mental level are noted like abnormal motor behavior, anxiety, aggression, interestedness, sleep changes, delusions, depression and impulsivity; also excited mood; irritability; and psychosis that shows total dependence and inactivity of the person (Fymat 2017a, b; Dougall et al. 2004; Van der Steen et al. 2014; Fink et al. 2018).

11.4 *Stages of Disease*

Dementia has four progressive and successive stages.

Mild cognitive impairment (MCI): Signs and symptoms in this stage are not severe enough to disturb routine work.

Early stage dementia (ESD): Symptoms are more noticeable.

Middle stage dementia (MSD): Symptoms generally worsen.

Late stage dementia (LSD): Symptoms change significantly (Fymat 2018a, b, c, d)

11.5 Diagnosis

Individuals with problems in their memory or thinking require proper assessment. Uncovering the reason may allow us to identify the path for the person to get the right treatment. However, diagnosis is usually done based on the information collected regarding the illness, initial tests, and cognitive testing with medical imaging, and probably by the blood tests which help in ruling out other causes or conditions.

11.5.1 Preliminary Testing

- **Niacin, Folate, or Vitamin B12 deficiency:**
For proper growth, cell production, and nerve function vitamin B12 is found to play an important role. But it did not show any improvement in persons with cognitive problems.
- **Delirium ("acute confusional state (ACS)"):**
This basically includes attentional deficit behavior and disorganization. It includes signs that involve changes in arousal, cognitive deficits, perceptual deficits, and a change in sleep-wake cycle, and psychotic features such as hallucinations and delusions.
- **Mental illnesses (depression and psychosis) testing:**
This can be studied by assessing psychiatry relating mental or emotional inconvenience to disordered brain function with Neuropsychiatric Inventory (NPI) or the Geriatric Depression Scale (GDS) tests.
- **Paralytic dementia (general paresis, general paralysis of the insane):**
It is a severe neuropsychiatric disorder that leads to cerebral atrophy in late-stage syphilis caused by chronic meningoencephalitis. There is a slow decrease in mental ability with symptoms of excitation of the central nervous system, leading to absolute dementia and paralysis.
- **Infective conditions:**
Include cryptococcal meningitis caused by fungus in soil, AIDS, a chronic life threatening condition, Lyme disease caused by bacteria, progressive multifocal leukoencephalopathy caused by virus and a disease that affects white matter of brain, subacute sclerosing panencephalitis, a neurological disorder which affects central nervous system, syphilis, a bacterial infection that results in neurological problems, and Whipple disease, a bacterial infection that affects joints and digestive system.

11.5.2 Cognitive Testing

- **Mini-Mental State Examination (MMSE):**
Personality assessment by making a note on routine activities and an assessment on behavior is done in MMSE and is considered as a useful tool.
- **Montreal Cognitive Assessment Test (MOCA):**
An online test which is considered as the better one in analyzing mild cognitive impairment (MCI).
- **Self-Administered Questionnaire (SAQ):**
A person's daily cognitive functioning is prepared to support the information obtained from brief cognitive tests.
- **Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE):**
In order to evaluate the dementia stage in elderly people, a short questionnaire is planned. It is a screening tool in which the details are filled by a relative or friend who has known the elderly person for 10 years or more. It is not known how precise the survey is for identifying dementia.
- **Alzheimer Disease Caregiver Questionnaire (ADCQ):**
Tool which helps to assess the chance that an individual has dementia suggestive of Alzheimer's disease. This test can be done online or in the office by a caregiver and has 90% accuracy.
- **General Practitioner Assessment of Cognition (GPAC):**
It was a tool designed for assessing cognitive impairment and can be done by primary care set.

11.5.3 Laboratory Tests

Certain cases that can be treated can be ruled by performing blood tests.

Tests include:

- Assessment of vitamin B12.
- Assessing folic acid.
- Estimating thyroid-stimulating hormone (TSH).
- Measuring the inflammation by C-reactive protein (CRP).
- Complete blood count which includes estimation of electrolytes, calcium, renal function, and liver enzymes.

11.5.4 Imaging Scans

Accurate diagnosis is done by brain scanning. Brain biopsy can also be conducted to get an accurate diagnosis which is usually not recommended.

- CT (computerized tomography), CAT (computerized axial tomography), and MRI (magnetic resonance imaging) scans are broadly used to study the brain which shows structural changes happening in the brain tissue.
- Changes in the brain can be analyzed by SPECT (single photon emission computerized tomography) and PET (positron emission tomography) scans (Fymat 2018a, b, c, d).

11.6 Nutritional Treatment

11.6.1 Polyphenols

In potentially functional foods, polyphenols have been found to have an important role as an anti-inflammatory and antioxidant property. Polyphenol compounds from various types of food intake have remarkable effects in protecting the metabolism especially in brain tissues. Now, there is a new dietary protocol available for polyphenol collection which helps people a lot (Burckhardt et al. 2016). Highest content of polyphenols in blueberries have strong antioxidative benefits which protect the function of mitochondria and decelerate the structure and function of neurons in PD (Knaze et al. 2018) and AD inhibiting amyloid- β aggregation. Blueberries, blackberries, grapes and apples, green and black tea, wine, coffee, cocoa and spices such as turmeric and curry have polyphenols and are found to have anti-inflammatory, antioxidant, and neuroprotective properties (Visioli and Burgos-Ramos 2016).

11.6.2 Resveratrol

Resveratrol content can be made available by taking adequate or reasonable intake of red wine (one glass per meal) that contributes one component which has a promising effect of Med Diet (Strathearn et al. 2014; Granzotto and Zatta 2014) that reduces the risk of dementia including AD (Bastianetto et al. 2015). Also, reasonable intake of alcohol that is around ≤ 12.5 g/day reduces the risk of dementia, while excessive drinking about ≥ 38 g/day increases the risk (Braidly et al. 2016).

11.6.3 Olive Oil

Olive oil helps in counteracting neurological diseases and this has been explored in an experiment with animal model and humans. Oleocanthal (phenolic compound) extract which is derived from extra-virgin olive oil was administered to C57BL/6 wild-type mice showed an increase in the β -amyloid clearance from the brain where

its accumulation is an important event in AD (van der Zwaluw et al, 2014). These data assist and support the preventive effect of extra-virgin olive oil on AD (Hubbard and Sinclair 2014), showing a balance in the antioxidant system with a positive effect on cognitive function (Abuznait et al, 2013). High rate of polyunsaturated omega-3 fatty acids in the olive oil helps in inhibiting β -amyloid accumulation and aggregation of a protein tau which is the main constituent of neurofibrillary tangles and helps the brain in efficient clearing, thus reducing the risk of AD (Hubbard and Sinclair 2014).

11.6.4 Fruit and Vegetables

Anti-inflammatory effect and increased immune cell response can be increased by taking lot of fruits and vegetables (Pang and Chin 2018; Hosseini et al, 2018). Stabilization of blood sugar can be achieved by consuming moderate amount of wine with a diet rich in protein, fruits, and vegetables that would protect against the development of ALS (Kang et al, 2005). Also care should be taken because a diet with higher intakes of fruits and vegetables enhances the immune cell profile and reduces pro-inflammatory mediators (Pang and Chin 2018). Along with the former, higher legume and fish intake were also considered to be associated with the larger cortical thickness (Okamoto et al, 2009).

11.6.5 Insulin Signaling and Calorie Restriction (CR) Effect

It is noted that hyper-caloric diet with a glycemic load (helps to know the amount of carbohydrate in the food with its raise in blood glucose levels) that is very high has a negative impact in patients with higher amyloid deposition in the brain (Staubo et al, 2017). Studies revealed that if the calorie intake is reduced it has a valuable effect on health that helps in increasing lifespan and improvement in neuroprotection (Taylor et al, 2017).

11.6.6 Ketogenic Diet and Brain Function

Ketogenic dietary intervention helps to replace carbohydrates with average amounts of proteins and high amounts of fats, that is, carbohydrates intake is reduced to 10% of daily calories, and fat content is increased to 90% of total calorie intake leading to ketones body formation (Perera and Turner 2016) that can be detected in the urine (Vining et al, 1998). When the protein intake is high or average it does not relate with ketones body formation (Westman et al, 2007). Thus, the ketogenic diet is said to be

effective in improving the control of epilepsy (Cassady et al. 2007; Villaluz et al. 2018), and motor control (McDonald and Cervenka 2017).

11.6.7 *Traditional Medicines and Diets*

Ginkgo biloba L.: In earlier studies, *G. biloba* has been used to treat cognitive dysfunction, dementia, and AD by German physicians. Extracts of *G. biloba* leaves (EGb 761) were registered and the products developed from the same are patented and commercialized in the early 1970s (Wagner 1999). Currently, extracts from *G. biloba* leaves are widely recommended in Europe and USA for the treatment of AD and a nonspecific age-related deterioration of mental functions, and for the improvement of blood flow in the cerebral region and to improve memory (Birks et al. 2002).

Panax ginseng: Ginseng root is found to contain ginsenosides (triterpenic saponins complexes) which is considered an adaptogenic herb that is found to elevate the body's resistance towards tension, shock, nervousness, and weakness by controlling the immune function. Moreover, it helps in increasing the memory, learning performance, and motor activity (Radad et al. 2006).

11.6.8 *Ayurvedic Medicine*

Curcuma longa L: Previous studies have emphasized the wide use of *Curcuma* among Indians that explains their role in reducing the prevalence of AD in India compared to USA (Ganguli et al. 2000). Process of inflammation shows a major role in the pathogenesis of the most chronic illnesses, including neurodegenerative diseases. However, the therapeutic potential of curcumin as anti-inflammatory agent has been highlighted in the prevention and treatment of chronic disorders (Aggarwal and Harikumar 2009).

11.7 *Supplements*

11.7.1 *Vitamin B12 and Folic Acid*

Deficiency of both vitamin B12 and folic acid in the cases of dementia has proved that dietary and supplementary intake of these vitamins and iron do not help in the treatment of dementia (Nelson et al. 2009). In contrast, few studies have shown that supplemental intake (via parental substitution) of these vitamins and folic acid has helped in treating such as neuropsychiatric disease (Goebels and Soyka 2000; Stanger et al. 2009). However, in all the cases the dietary intake of vitamin B12

does not progress the dementia treatment as most of the older adults are found to have atrophic gastritis with altered production of intrinsic factor and decreased stomach acid excretion. Therefore it is highly suggested to take supplements and/fortified foods like cereals with high vitamin B12 and folate content (Stover 2010).

11.7.2 Vitamin B1

According to the report published by University of Maryland and Medical Centre, and University of Michigan Health system, around 50 g of vitamin B1 per day can help in the treatment of dementia and also supports a few enzymes and cholinergic neurons which are responsible for transmission of nerves related to dementia and few other brain related issues. Grain products, nuts, seeds, pork, legumes, and organ meats are highly rich in vitamin B1. Regarding vitamin B1 intake, supplemental vitamins are good only for a few groups of people; however, for major people it is very hard to absorb and these multivitamin pills are also known to cause cancer in few people. And so, nutritionists highly suggest taking a healthy diet with more thiamine content. Taking a vitamin supplement may boost thiamine intake to help maintain a healthy brain but as a supplement intake thiamine is found to be poorly absorbed. Nutritionists suggest that healthy diet would be a better approach, because multivitamin pills may have increased risk of cancer in some people (Gibson et al. 2016).

11.7.3 Niacin

In general, vitamin B3 (niacin) deficiency leads to increased risk of dementia. However, a study was conducted to check whether the dietary intake of niacin was associated with cognitive neurological diseases related to dementia by Morris et al. (2004). The study was carried out in individuals with an age group of 65 and above for a period of around 5.5 years. They have identified that higher intake of niacin food was related to a slower annual rate of dementia. From the data they have concluded that dietary niacin acts against dementia related cognitive decline (Morris et al. 2004). In another study, Gregory administered large doses of intravenously supplemented niacin, in addition to dietary intake, they have successfully recovered from dementia and were suggested to continue the same for a period of time to protect themselves from this cognitive decline (Prousky 2011; Gregory 1952). High niacin foods include fish, turkey, pork, chicken, beef, brown rice, peanuts, mushrooms, green peas, and avocados.

11.7.4 Polyunsaturated Fatty Acids (PuFa)

A notable improvement has been reported in cognition and memory in healthy (Kuelzow et al. 2016; Witte et al. 2014) and AD patients after supplementation with eicosapentaenoic (EPA) and docosahexaenoic acid (DHA) (Zhang et al. 2015; Kuelzow et al. 2016). Some studies showed that there is a reasonable effect of omega-3 fatty acids on brain atrophy where its effect is well seen in reducing the neurodegenerative and inflammatory diseases but it is limited to patients with physiological B vitamin status that highlights the importance of finding out subgroups in clinical outcomes who are highly benefited (Kuelzow et al. 2016; Jermerén et al. 2015) to bring down the amount of the amyloid- β -induced toxicity (Regitz et al. 2016).

11.8 Conclusion

Nutrition represents the most promising approach to prevent the neuronal and cognitive decline in neurodegenerative and non-neurodegenerative diseases which may worsen with time and has no cure at all. Insulin action in brain is very well connected with decline in cognitive function. AD is more prevalent in high-glycemic diet, while a low carbohydrate-high protein diet supports the hormonal action and a diet with high-fat has control over neuro-inflammation in central and peripheral nervous systems. In support with the above said high-doses of B vitamin supplementation is found to show positive effects in patients with cognitive dysfunction. Also, the most analyzed nutrients like ω -3 and ω -6 polyunsaturated fatty acids from fish, poultry, nuts, and margarine, as well as, folic acid, vitamin C and E have given a better result. Along with the previous diet, intake of polyphenol-rich foods like blueberries, blackberries, grapes, apples, or beverages such as green and black tea, coffee, and red wine is proven to be beneficial and found to give promising results. General function of brain and its protection can be boosted by taking a Mediterranean diet. In addition, caloric restriction may be counterproductive in elderly. For the treatment of neurodegenerative disorders in future, plants with relevant medicinal and therapeutic activity may be exploited. Clinical effectiveness and potential toxicity of active plants and compounds isolated from them in larger trials require deep study and evaluation before recommendations is done. The use of a polyvalent "cocktail" of drugs can be advised in future which helps to boost different mechanisms such as antioxidant activity, anti-inflammatory activity, and the inhibition of the formation of fibrillary tangles and β amyloid plaques.

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