

# A Review on Role of Nutraceutical in Alzheimer's Disease

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**Abstract:** *Nutraceuticals are the products derive from food sources with extra health benefits. They can prevent malignant processes. The term 'nutraceuticals' combines two words 'nutrients ( a nourishing food component ) and 'pharmaceuticals'(a medical drug ) The philosophy behind nutraceuticals is according to Hippocrates " Let food be your medicine". Categories of nutraceuticals are dietary supplements, functional food, medicinal food, pharmaceuticals. Advance age is often characterized by a declined in large spectrum of cognitive abilities including reasoning, memory, perceptual speed and language. Alzheimer's disease (AD) is the most common and feared from dementia representing circa 70% of all dementia cases and displaying a dramatic epidemics due to the enormous growth of the aged population worldwide. It is still unclear which factors lead to molecular cascade of neurodegeneration in AD, but along with genetic environmental factors vascular pathology and risk factor have been recently shown to play crucial role in AD pathogenesis .AD impacts dramatically on everyday life of older adults, being one of the main cause of disability in old age. There is clear evidence that a diet rich in specific nutritional food group (fruit, fish, vegetables) can reduce the incidence and prevalence of some of the main clinical outcomes, such as neurodegenerative disorders, cardiovascular diseases, diabetes, cancer. This specific nutritional food group are rich in micronutrients and vitamins are beneficial for health. The Mediterranean diet is characterized by a high consumption of plant food, fish olive oil as primary source of monounsaturated fat and moderate intake of wine. In this article, we focus our attention on group of substance proposed to prevent or treat Alzheimer's disease.*

**Keywords:** Dementia, antioxidant vitamin, Cognitive impairment, Alzheimer's disease, prebiotics, probiotics, dietary fibres, human diet.

## I. INTRODUCTION

Nutraceuticals are items that are both nutritional and medicinal in nature. A nutraceutical product is a chemical that has physiological benefits or provides protection against chronic disease. Nutraceuticals can be used to improve health, reduce the ageing process, prevent chronic diseases, lengthen life, and keep the body's structure and function in good shape. Nutraceuticals have gotten a lot of press recently because of their potential nutritional, safety, and therapeutic benefits. Recent study has shown that these substances have the potential to cause a wide range of issues. The current study worked hard to provide new nutraceutical concepts in Alzheimer's disease.

Alzheimer's disease (AD) is the most common type of dementia and is a chronic neurological illness that often begins slowly and progresses over time. It is the cause of 60–70% of dementia cases in the elderly population if acetylcholine levels are low.

It has been reported. The accumulation of beta amyloid protein in the brain causes Alzheimer's disease. pieces, generating hard plaques that obstruct acetylcholine's ability to affect synaptic transmission. spread of infectious agents and the initiation of inflammatory processes, as well as a change in the chemical composition of In Alzheimer's disease, a particular protein called tau causes neuron death. Tubules are formed when microtubules join with other tubules to form neurofibrillary tangles. Cell death occurs as a result of disintegration and blockage of neurotransmitters. (Marianna and colleagues, 2010). Nutraceuticals are pharmaceutical-quality supplements.

## II. STAGES OF ALZHEIMER'S DISEASE

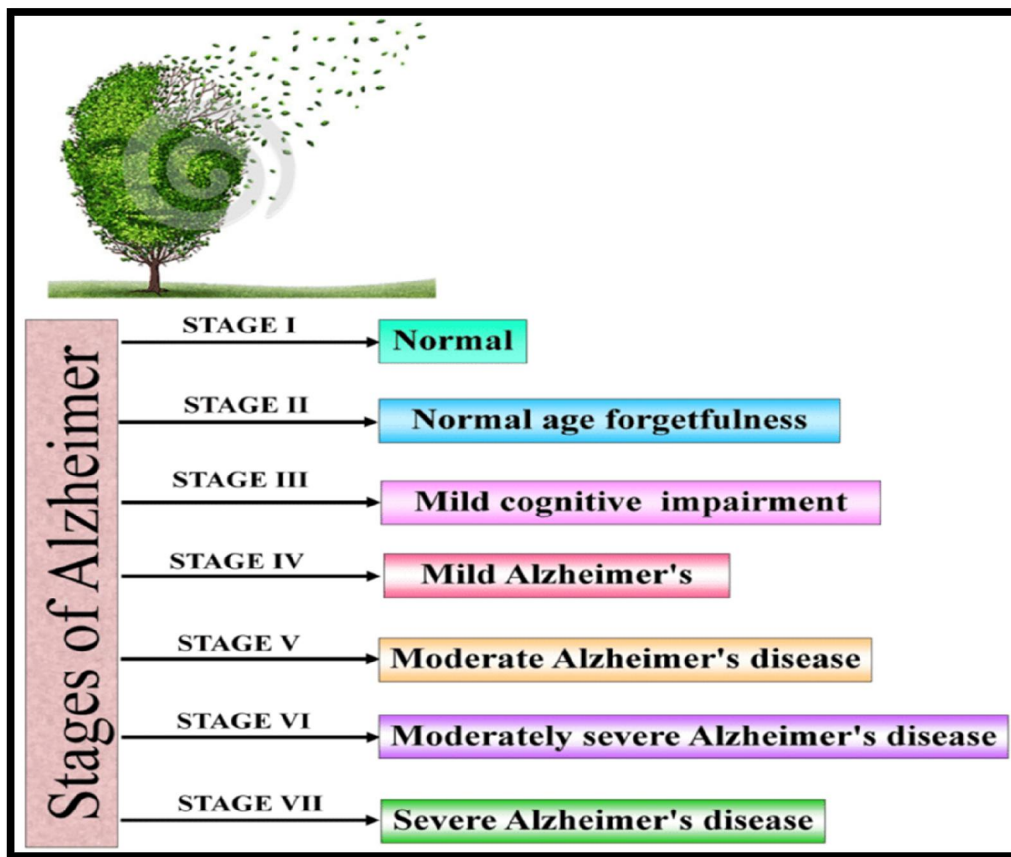


Fig 1 – Stages of Alzheimer's Disease(AD)

### Stage 1

Alzheimer's disease usually starts silently, with abnormalities in the brain appearing years before anyone notices anything is amiss. You won't be able to identify any indicators if your loved one is in this stage. A PET scan, a sort of imaging test that demonstrates how the brain works, is the only way to detect if they have Alzheimer's.

### Stage 2

You may not notice anything out of the ordinary in your loved one's behaviour, but they may notice minor changes that even a doctor might miss. Things like losing words or misplacing stuff are examples of this.

### Stage 3

You may observe changes in your loved one's thinking and reasoning at this point, such as: Forgets what they've just read, asks the same question over and over, and has increasing difficulty planning or organising. When meeting new people, I have trouble remembering names.

### Stage 4

During this time, the thinking and reasoning flaws you identified in stage 3 become more apparent, and new issues emerge.

### Stage 5

It's possible that your loved one will lose track of where they are and what time it is. They may forget their home location,

phone number, or the school they attended. They can be unsure of what to wear for the day or season.

#### Stage 6

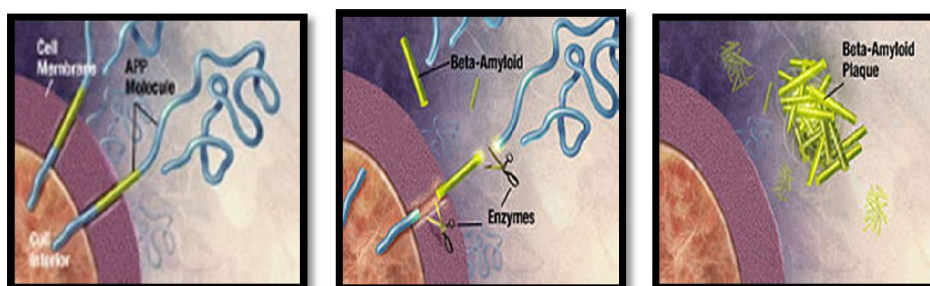
As Alzheimer's disease progresses, your loved one may recognise faces but forget names. They may even mistake one person for another, such as mistaking their wife for their mother. Delusions may develop, such as the belief that they must go to work even though they do not have one.

#### Stage 7

During this time, a person with Alzheimer's loses several basic abilities, such as eating, walking, and sitting up.

### III. METHODOLOGY

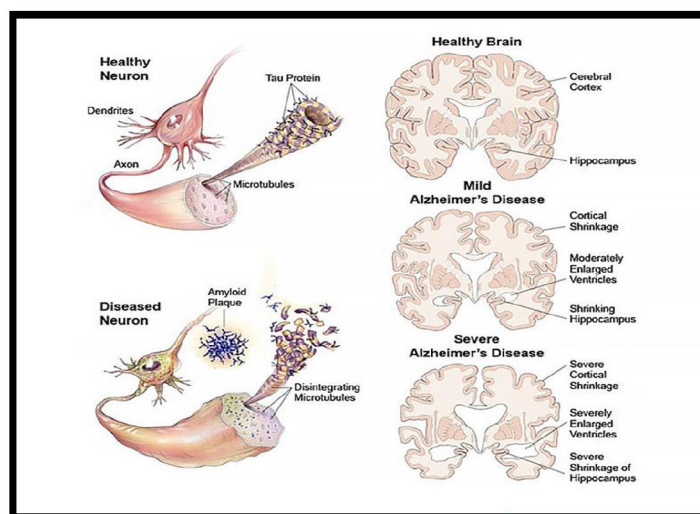
#### Mechanism of Alzheimer's disease -



**Fig 2 - Enzymes act on the APP (amyloid precursor protein) and cut it into fragments. The beta-amyloid fragment is crucial in the formation of senile plaques in AD.**

It's unclear how disruptions in beta-amyloid peptide production and aggregation cause the pathophysiology of Alzheimer's disease. The aggregation of beta-amyloid peptides is thought to be the central event that causes neuron degeneration, according to the amyloid hypothesis. Programmed cell death is induced by the accumulation of aggregated amyloid fibrils, which are thought to be the toxic form of the protein responsible for disrupting the cell's calcium ion balance (apoptosis). A is also known to accumulate specifically in the mitochondria of Alzheimer's-affected brain cells, inhibiting some enzyme processes and glucose utilisation by neurons.

#### Progression of Alzheimer's disease



**Fig 3 - Progression of Alzheimer's disease**

### How it Happens?

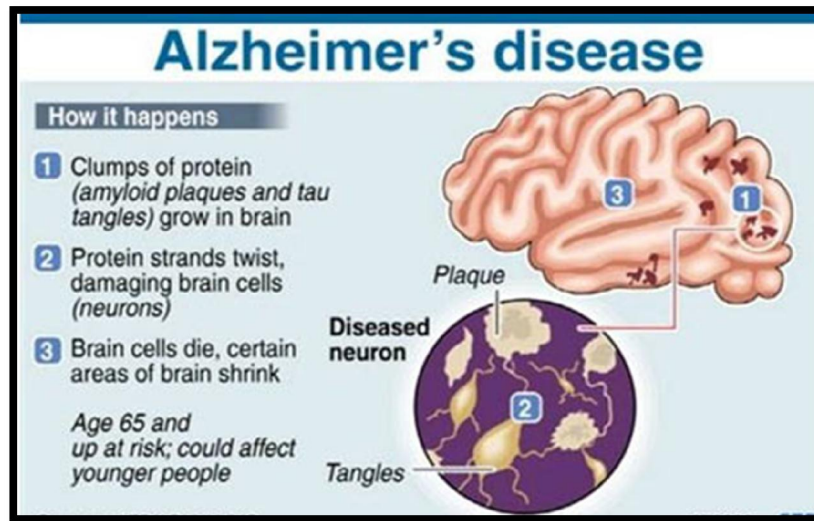


Fig 4 How AD Happens?

### IV. SYMPTOMS

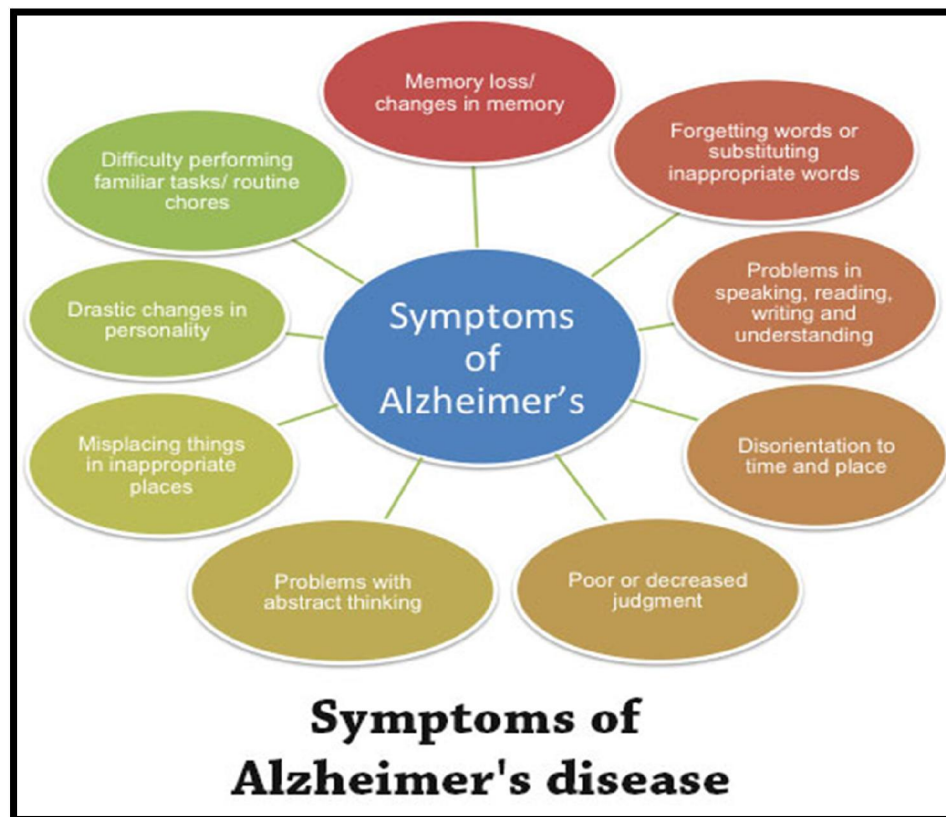


Fig 5 – Symptoms of AD



### CAUSES

The exact cause of AD aren't fully understood but at its core are problems with brain protein that fail to function normally, disrupts the work of brain cell (neuron).

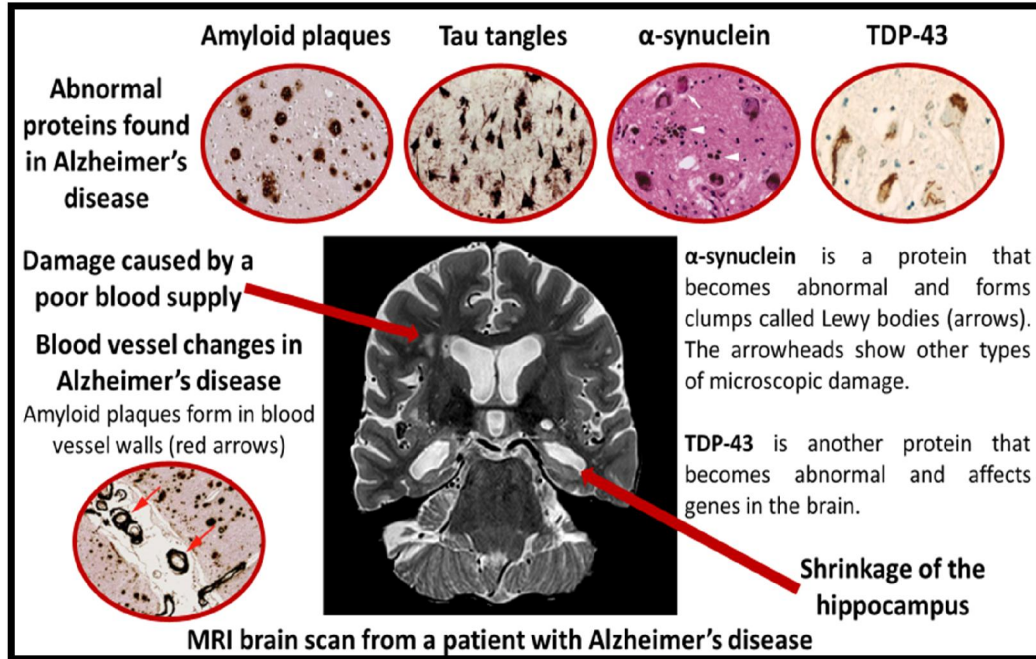


Fig 6 – Causes of AD

### RISK FACTORS

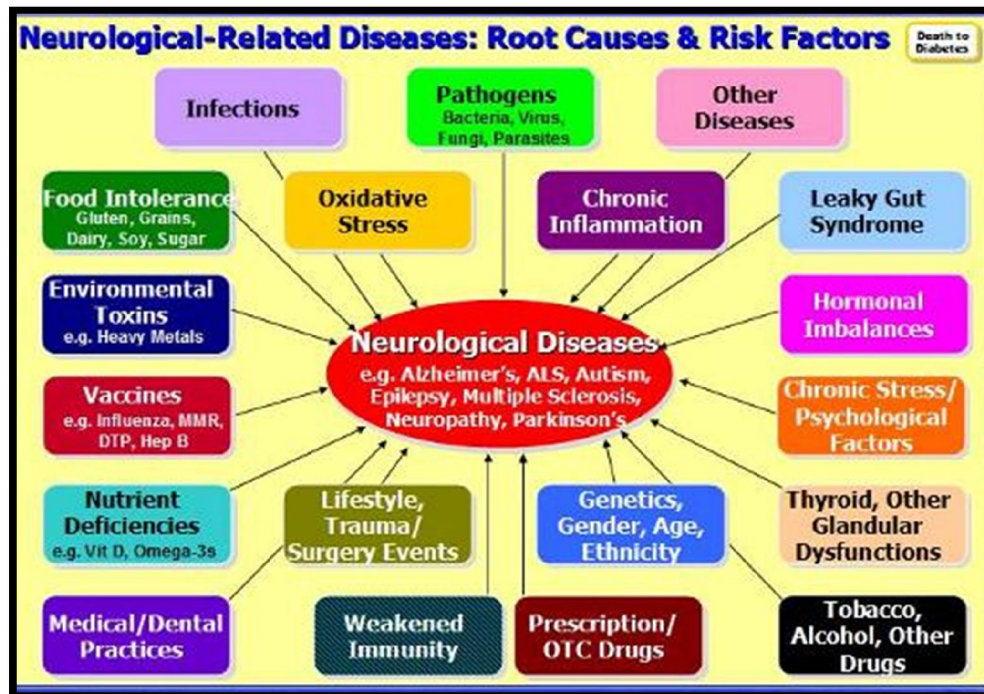


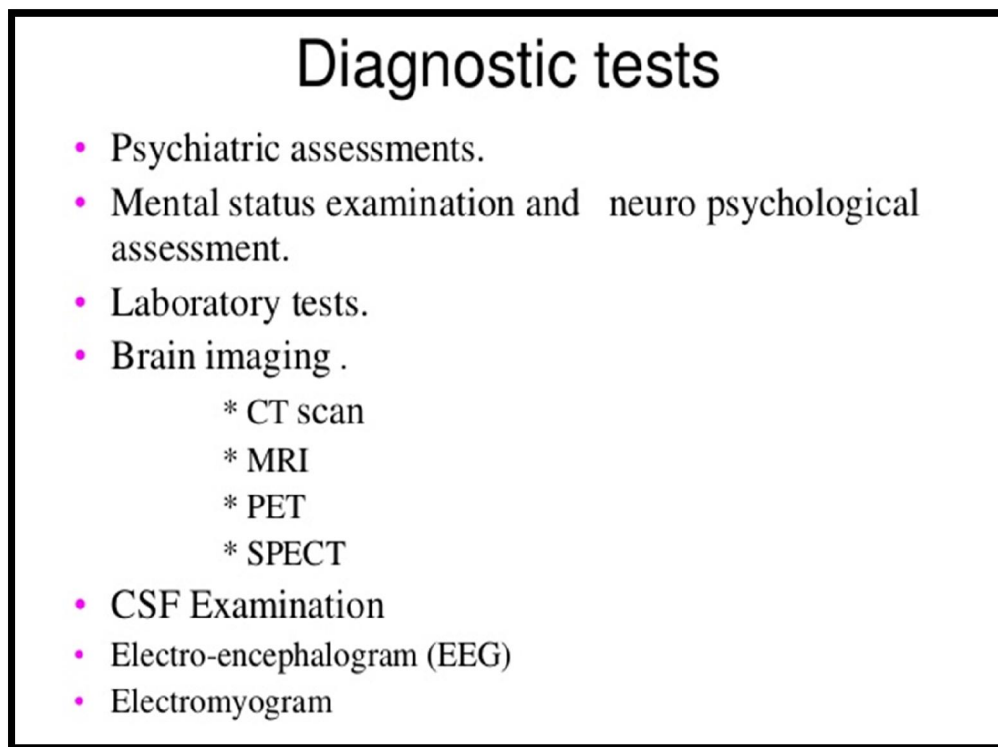
Fig 7 – Risk Factors of AD

## V. DIAGNOSIS

A diagnosis of Alzheimer's disease is also based on memory and thinking abilities tests administered by your doctor. The full diagnostic toolkit is designed to detect dementia and determine whether it is caused by Alzheimer's disease or another condition with a high degree of accuracy. When microscopic examination of the brain reveals the telltale plaques and tangles, Alzheimer's disease can be diagnosed with absolute confidence after death.

### Tests

A diagnostic work-up would likely include the following tests -



**Fig 8 – Diagnostic Tests for AD**

### Treatment

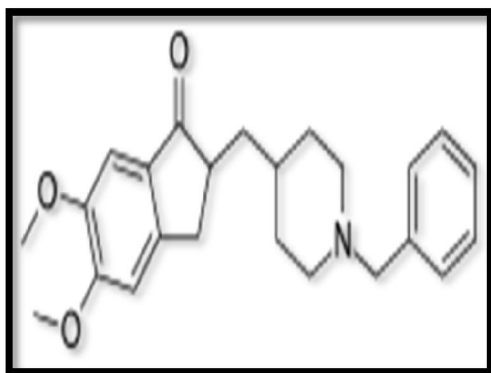
A number of medicines may be prescribed for Alzheimer's disease to help temporarily improve some symptoms. The main medicines are:

- **Acetylcholinesterase inhibitors** - These medicines increase levels of acetylcholine, a substance in the brain that helps nerve cells communicate with each other. Donepezil, galantamine and rivastigmine can be prescribed for people with early- to mid-stage Alzheimer's disease.
- **Memantine (NAMEDA)** - This medicine is not an AChE inhibitor. It works by blocking the effects of an excessive amount of a chemical in the brain called glutamate. Memantine is used for moderate or severe Alzheimer's disease. It's suitable for those who cannot take or are unable to tolerate AChE.

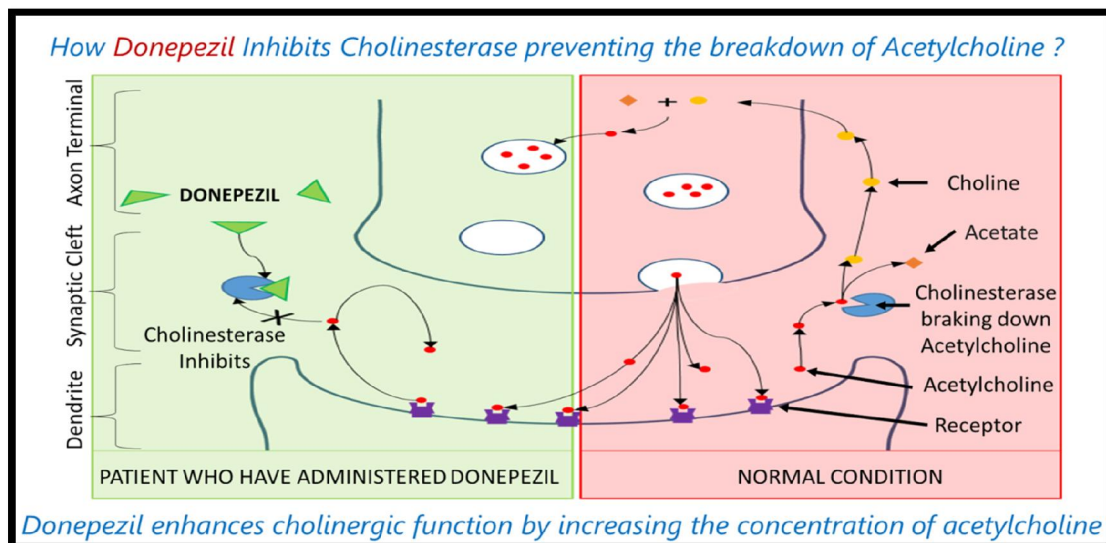
### Molecular mechanism of donepezil:

- |    |                     |  |
|----|---------------------|--|
| a. | <b>Formula -</b>    | $C_{24}H_{29}NO_3$                       |
| b. | <b>Molar mass -</b> | $379.50 \text{ g} \cdot \text{mol}^{-1}$ |

**Molecular structure of Donepezil -**



**Fig 9 – Structure of Donepezil**



**Fig 10 – Mechanism of Donepezil**

Donepezil is an oral medication used to treat Alzheimer's disease. It belongs to a class of drugs called cholinesterase inhibitors that also includes tacrine (Cognex). Scientists believe that Alzheimer's disease may result from a deficiency in chemicals (neurotransmitters) used by nerves in the brain to communicate with one another. Donepezil inhibits acetylcholinesterase, an enzyme responsible for the destruction of one neurotransmitter, acetylcholine. This leads to increased concentrations of acetylcholine in the brain, and the increased concentrations are believed to be responsible for the improvement seen during treatment with donepezil. Donepezil improves the symptoms but does not slow the progression of Alzheimer's disease. Donepezil was approved by the FDA in 1996.



**Natural Remedies for Treating Alzheimer's Disease**

**Coconut oil** is a form of healthy and necessary fat. It helps in restoring the nerve lining, which facilitates the communication in the brain and improve its functioning in an unusual way. 

**Turmeric in Curries:** Evidences have shown that curcumin, which is found in turmeric can be used in preventing Alzheimer's disease. 

**Ginger** is used for stimulating poor appetite. Drinking ginger tea or chewing a mixture of ginger, salt and lime juice can help in increasing thirst as well as appetite. 

**Lemon oil:** Mix a few drops of peppermint or lemon oil in warm water and breathe in. This can help in alleviating depression and lethargy that is often associated with AD. 

**Basil** can be mixed with Sage in a cup of warm water to relieve the depression. 

**Baking soda** forms a part of every home's kitchen and is known to be the best remedy. A mixture of salt and baking soda can be used instead of toothpastes that are available in the market. 

**Meal supplements:** Such canned meals can be easily consumed as they are equipped with minerals and vitamins. 

**Sesame, Sunflower and Pumpkin Seeds** can be used as a pastime snack as they are full of fatty acids, which improve the brain functioning. 

**Ayurveda** has identified the perks of using sesame oil. Alzheimer's sufferers are often struck with depression and a few drops of warm sesame oil in the nostrils may relieve it. 

**Vinegar:** Like all other home remedies, Vinegar can be used for many functions. During the sufferers of Alzheimer's disease, lose the ability to control their urination, vinegar can be used to help with the hygiene. 

**Vitamin A:** Carrots are a rich source of beta-carotene and are a safer way to fill the body with Vitamin A. 

**Vitamin C:** An anti-oxidant which renders protection to the nerves of the brain. Citrus fruits are loaded with this vitamin. 

**Fatty Acids** are essential for better brain functioning and fish is considered to be a rich source of it. It is advisable to include fish in the diet at least two times a week. 

**Leafy Vegetables:** Spinach, Swiss chard, Kale along with all the other leafy vegetables are rich in folic-acid as well as may help in stimulating the cognitive function as well. 

**Consuming Orange juice** alternatively is also a great way to improve your intake of Vitamin C. 

**Soy Protein** contains isoflavones that may help in protecting post-menopausal women from suffering with Alzheimer's disease. 

Fig 11 – Natural Remedies for Treatment of AD



## VI. PREVENTION

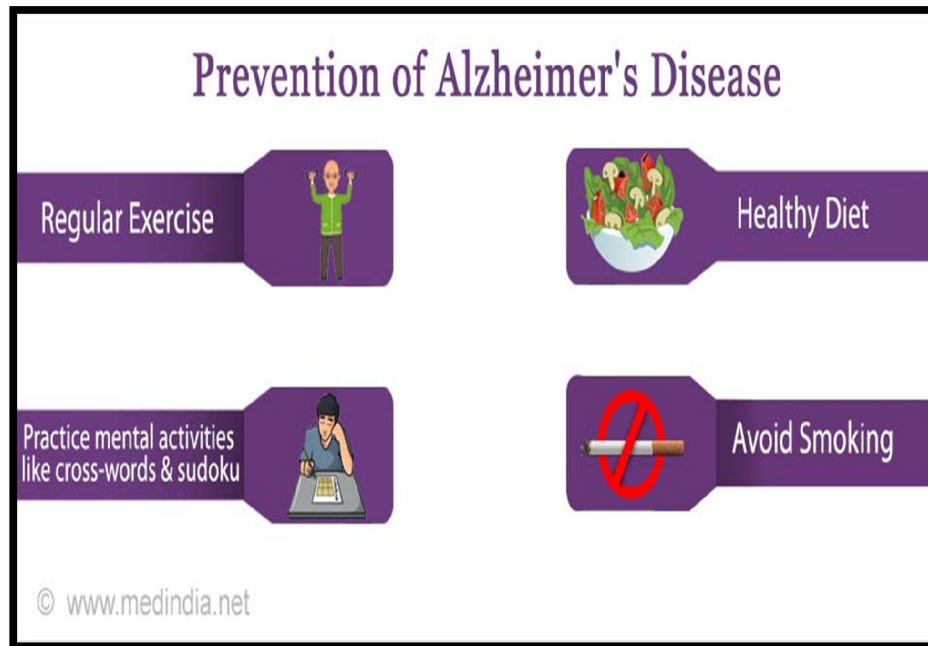


Fig 12 – Prevention of AD

## VII. CONCLUSION

- When placed in the context of a healthy lifestyle behaviour, age related changes in nutrition may play an important role in brain functioning as well as in major organ functioning of old people .
- No cure for Alzheimer’s disease: medications can help slow the progress of cognitive decline.
- Women are more affected than men at a ratio of almost 2:1 due to in part to the larger population of women who are over 70.

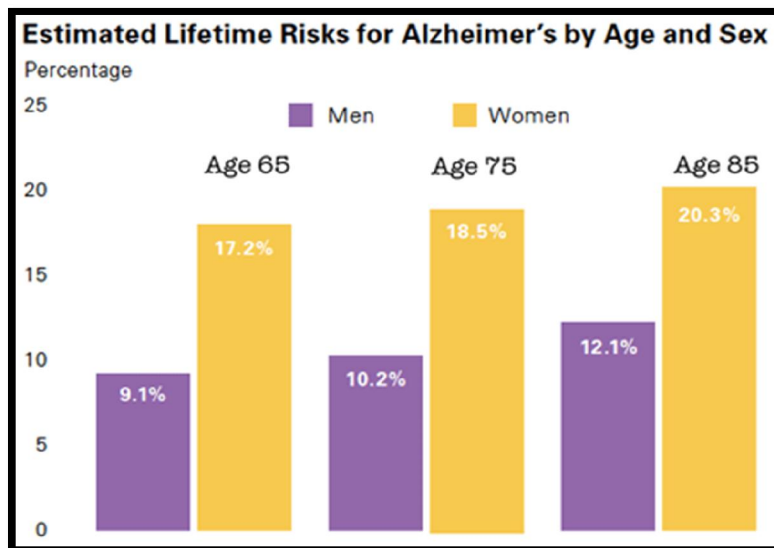


Fig 13 – Risk of AD by age & sex

- Benefits for the treatment of symptoms in mild to severe AD using AChEIs and Memantine is seen.
- As the cell die, parts of the brain shrink and stop working. There are three telltale signs of AD in the brain:
- Clumps of material in the spaces between brain cells called amyloid plaques.
- Tangles of protein molecules inside brain cell.
- Loss of connection between brain cells.

#### **ACKNOWLEDGMENT**

We excess my thanks and gratitude to Trustee of Samarth Rural Educational Institute's and Samarth Institute of Pharmacy, Belhe with their valuable guidance and support.

#### **CONFLICT OF INTEREST**

The author declared no conflict of interest.

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