

Understanding Alzheimer's disease in geriatric patients: A growing challenge



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Abstract

Alzheimer's disease is the major cause of dementia which leads to impairment of memory, thinking, and behavior, primarily affecting individuals aged 65 and older. Genetic factors, including variations in the apolipoprotein E (APOE) gene, and the aggregation of amyloid plaques and tau tangles, are key contributors to the disease. Some Environmental and lifestyle factors, such as diet, exercise, and cognitive engagement, also affect the risk. With the aging global population, the spread of Alzheimer's is projected to elevate from 50 million to over 150 million by 2050. Diagnosis involves medical history, cognitive tests, and brain imaging, though definitive diagnosis is post-mortem. Treatments include cholinesterase inhibitors and memantine to manage symptoms. The increasing prevalence highlights the need for ongoing research into Alzheimer's mechanisms and interventions.

Keyword: Alzheimer, dementia, amyloid plaques

1. Introduction

Alzheimer's disease is a neurological condition that impairs a person's thinking, memory, and behaviour. It is the most typical cause of dementia, a word used to describe a general decline in cognitive function that is severe enough to cause problems in day-to-day functioning. The disease typically starts with relatively low memory loss but it can progress to severe impairment in cognitive and physical functions. The most prevalent form of Alzheimer's typically affects individuals aged 65 and older and is linked to a change in the apolipoprotein E (apoE) gene on chromosome 19. This genetic variation influences the disease's development by affecting amyloid plaque accumulation in the brain, leading to the apoptosis of brain cells (1).

2. Global statistics (2,3)

2.1. Current prevalence

Alzheimer's disease is the most frequent type of dementia, with an estimated 55 million individuals worldwide living with this condition, according to the World Health Organisation (WHO). According to Alzheimer's Disease International (ADI), there will be 139 million people living with dementia, a treble increase from current predictions.

2.2. Regional variations

- **North America:** Over 6.2 million people aged 65 and above are currently living with Alzheimer's disease in the United States. This number is only expected to grow from here and reach a staggering 13.8 million by 2060. With the increase in the spread, the number of deaths caused by Alzheimer's has also shown a significant rise in recent years and without any intervention, this number is only expected to grow further.

- **Europe:** Europe has a significant prevalence of Alzheimer's, with countries like Germany, Italy, and France having large aging populations that are increasingly affected.
- **Asia:** Asia is experiencing rapid increases in Alzheimer's cases due to its large and aging population. Countries like China and India are seeing a substantial rise in the number of affected individuals.

3. Etiology

The etiology involves an intricate interplay of genetic, environmental, and lifestyle factors. In order to develop prevention measures and to devise effective treatment procedures, it is crucial to know the cause of Alzheimer's (4). Key elements contributing to the development of Alzheimer's (Figure 1) (5).



Figure 1. Showing the factors contributing to the development of Alzheimer's

3.1. Factors responsible for Alzheimer's disease (5-8)

- **Family history:** Alzheimer's disease is more common in people who have a family history of the illness. Numerous genes have been linked to the condition, but the apolipoprotein E (APOE) gene is the most well-known. Alzheimer's disease risk is greatly increased by the APOE ε4 allele.
- **Genetic mutations:** Rarely, mutations in particular genes, such as APP (amyloid precursor protein), PSEN1 (presenilin 1), and PSEN2 (presenilin 2), result in early-onset Alzheimer's disease. The aberrant proteins produced as a result of these mutations aid in the progression of the illness.
- **Amyloid plaques and tau tangles:** The buildup of beta-amyloid plaques between brain neurons is one of the hallmarks of Alzheimer's. These sticky protein clumps impair cell-to-cell transmission and set off inflammatory reactions that cause damage and death to neurons. Tau Tangles can form inside neurons when tau proteins undergo aberrant modification. Cell death results from these tangles' disruption of the movement of vital nutrients and other materials within cells.
- **Inflammation and immune response:** Chronic inflammation and immune responses affecting the brain are also believed to play a role in Alzheimer's. The brain's immune cells, also called microglia, may become overactive and release chemicals that cause damage to neurons. Deregulated immune responses may also contribute to the amyloid plaques and tau tangles aggregation.
- **Vascular contributions:** Poor cardiovascular health, including conditions like hypertension, diabetes, and atherosclerosis, can increase the risk of Alzheimer's. Vascular issues may reduce blood flow to the brain, leading to neuronal damage and contributing to the development of the disease.

- **Lifestyle and environmental factors:** Obesity, a poor diet, and inactivity are linked to an increased risk of Alzheimer's. On the other hand, frequent exercise and a nutritious diet, such the Mediterranean diet, may lower risk. An increased life expectancy and sustained mental activity are associated with a decreased risk of Alzheimer's disease. Building cognitive reserve through mental stimulation may help the brain continue to operate normally even in the face of pathological alterations. There has been evidence linking traumatic brain injuries, particularly recurrent concussions, to a higher risk of Alzheimer's disease.
- **Age factor:** Age is the biggest risk factor for Alzheimer's. The chances of developing the disease increases dramatically after an individual crosses the age of 65, with risk almost doubling approximately every five years thereafter (Table 1).

Although the etiology of Alzheimer's disease is known to be influenced by these factors, research is still ongoing to determine the precise processes via which these factors interact to cause the disease. To effectively prevent and cure Alzheimer's disease, it is imperative to identify and comprehend these pathways.

Globally, the most common type of dementia, Alzheimer's disease, is becoming far more common. More than 50 million individuals worldwide already suffer from Alzheimer's disease or other dementias, and by 2050, that figure is expected to increase to over 150 million. The world's aging population is mostly to blame for this growth, since the risk of Alzheimer's disease increases dramatically with age.

Table 1: Geriatric patients cover the majority of Alzheimer’s disease percent

Age Group (in years)	Percentage of Americans Who suffer from Alzheimer’s (%)
55-64	0.8
65-74	2-3
75-84	17-19
85+	42

In developed countries, where healthcare systems have extended life expectancy, the impact is especially pronounced. However, countries are also experiencing a surge in Alzheimer's cases as their population age and life spans increase.

4. Diagnosis (3)

Diagnosing Alzheimer's disease involves a multi-faceted approach since there's a lack of any single definitive test to diagnose the condition.

- **Medical history and physical examination:** The doctor reviews the health history of the patient which includes medications, and family history of dementia. A physical exam checks for conditions affecting memory and cognition.
- **Mental status examination:** Cognitive tests evaluate memory, problem-solving abilities, attention, and language. Examples of these tests are the Mini-Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA).
- **Brain imaging:** MRI and CT scans identify brain changes typical of Alzheimer's, like shrinkage in certain regions (amyloid plaques and tau tangles). Other changes like Abnormal Protein deposits may be detected by PET scans.

5. Possible treatments (4,9)

Alzheimer's disease currently has no known cure, yet its cognitive symptoms can be managed with two primary medication classes.

5.1. Cholinesterase inhibitors

These medications function by replenishing a neurotransmitter that is lost in the brains of those suffering from Alzheimer's disease and is necessary for cell-to-cell communication. Donepezil, galantamine, and rivastigmine are a few examples. Sleep problems, nausea, and diarrhea are common adverse effects.

5.2. Memantine

This drug slows the progression of symptoms in moderate to severe Alzheimer's disease by affecting a different brain cell communication network. A combination of Cholinesterase Inhibitors and Memantine can also be used. Memantine also has some side effects like agitation and anxiety.

5.3. Other medications

More medication are available to manage agitated, violent, or hazardous behaviors. Risperidone, quetiapine, and haloperidol are some examples. Because there is a chance of negative effects, they are typically prescribed in extremely low doses.

6. Future perspective

The disease's alarming future projections indicate that by 2050, the number of cases worldwide is predicted to triple. According to current estimates, there were approximately 57 million people living with dementia in 2019, but by 2050, this number is expected to increase to 153 million. Population ageing and growth are the main causes of this surge, especially in the Middle East and sub-Saharan Africa, where cases could rise by more than 350%. Risk factors include smoking, obesity, and high blood sugar are driving up the numbers, but education advancements may be slightly offsetting this trend. In the absence of noteworthy advancements in treatment and public health initiatives, Alzheimer's disease will persistently exert a profound influence on individuals, families, and healthcare systems worldwide (2,3).

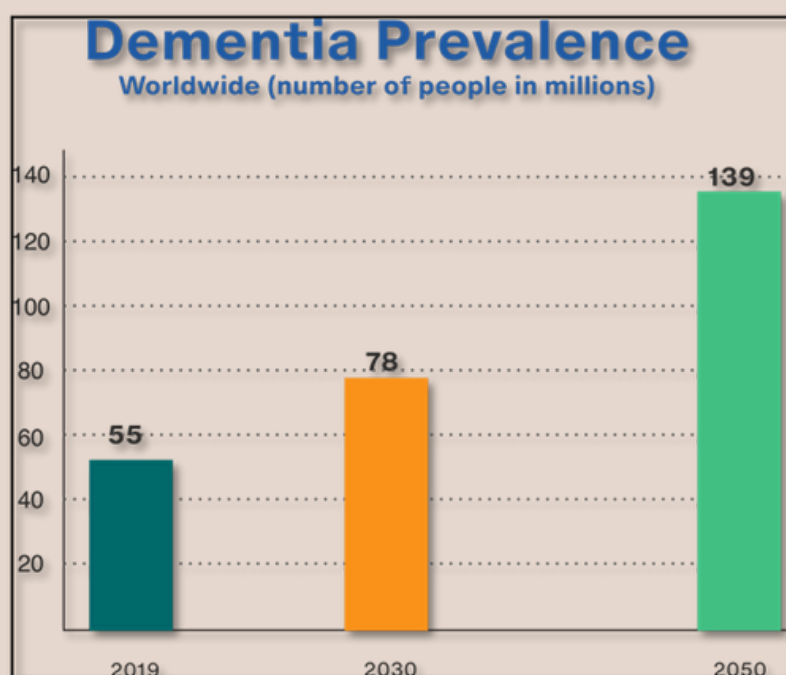


Figure 2. Worldwide dementia prevalence and projection (2)

7. Conclusion

Alzheimer's disease presents a formidable challenge in the realm of geriatric healthcare, as its prevalence continues to rise alongside the global aging population. This neurodegenerative disorder not only impacts the cognitive and physical health of patients but also places a significant emotional, psychological, and financial burden on caregivers and healthcare systems. Recent advancements in research have enhanced our understanding of Alzheimer's disease, offering new insights into its genetic and molecular underpinnings. Innovations in diagnostics, such as the development of biomarkers, and emerging therapeutic approaches provide hope for earlier detection and more effective management of the disease. Despite these strides, there remains an urgent need for continued research and public health initiatives aimed at prevention, early intervention, and comprehensive care.

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