

# Dementia in geriatric patients: Causes, management, and advancements



**Sarita Singh, Manju Pandey\***

Institute of Pharmacy, Shri Ramswaroop Memorial University, Barabanki,  
Uttar Pradesh, India-225003  
Email: manju16824@gmail.com

## Abstract

The global elderly population is rapidly increasing, leading to a rise in dementia cases worldwide. Dementia types include Alzheimer, Lewy Body, Fronto-temporal, Vascular, and Mixed Dementia. Management strategies involve medications like Cholinesterase inhibitors (Donepezil) and Memantine to improve cognitive function. Non-pharmacological interventions like Cognitive Stimulation Therapy, physical exercise, and occupational therapy are essential. Supportive care involves caregiver support, environmental modifications, and psychological counselling. Advancements in dementia care focus on early diagnosis using improved imaging techniques and biomarkers, genetic research for personalized treatments, and ongoing drug trials targeting amyloid plaques and tau tangles. Technology including AI and assistive devices enhances diagnosis and care. Lifestyle interventions such as diet and social engagement are being scrutinized for their protective effects on cognitive health. Ongoing research aims to discover potential cures for dementia to give quality life for elderly patients.

**Keywords:** Alzheimer, Cholinesterase, Biomarkers.

## 1. Introduction

Dementia significantly affects not only those diagnosed but also their families and caregivers, posing numerous challenges for health professionals from diagnosis to end-of-life care. Dementia represents an abnormal brain degeneration, leading to changes in cognitive abilities, communication, social interaction, and daily activities. Early finding of dementia and recognizing the definite type is essential for appropriate care. The pre-diagnosis also provides the family and friends the opportunity to organise and access the necessary support and resources in the community to help and sustain your individuality (1).

Alzheimer disease (AD) is the most widespread and is observed by brain plaques and tangles. The cognitive deterioration linked to dementia usually continues over time and is related to the patient's prior cognitive levels, regardless of isolated episodes of delirium. Dementia encompasses symptoms regardless of the underlying cause which include loss of memory, impairment of judgment and understanding, reduced decision-making abilities, altered emotional expression, mood changes, personality changes, difficulties with daily living tasks, speech and language comprehension issues, and challenges with social interactions (2,3).

## 2. Prevalence of dementia

In 2020 beyond 55 million individuals globally are affected by dementia and this figure doubles every 20 years getting to 78 million by the year 2030 and 139 million till 2050. Much of this increase will happen in developing countries, currently 60% cases are found; by 2050, this proportion is anticipated to escalate to 71%. The elderly people are growing most rapidly in India, China, South Asian and Western Pacific neighbours. Important factors that increase the risk of developing dementia include being over 65 years of age, hypertension, diabetes, smoking, and depression. This condition is prevalent among older adults, making it the most common neurological diagnosis in this age group (4,5).

## 3. Pathophysiology

Dementia pathophysiology primarily involves the accumulation of misfolded proteins and CVD (cerebrovascular disease). AD is the most common whereas late-onset dementia characterized by amyloid-beta plaques, driven by an imbalance in tau neurofibrillary tangles and amyloid-beta production and clearance. Table 1. Shows various types of dementia with their features and diagnostic tests. Biomarkers, including PET and blood tests, are advancing the diagnosis and understanding of these conditions. Genetic factors also play a significant role, particularly in early-onset cases. Neuro-inflammation and cholinergic transmission deficits are additional contributors to dementia's pathogenesis (6-9). Below Figure 1 shows various pathological factors that leads to dementia.

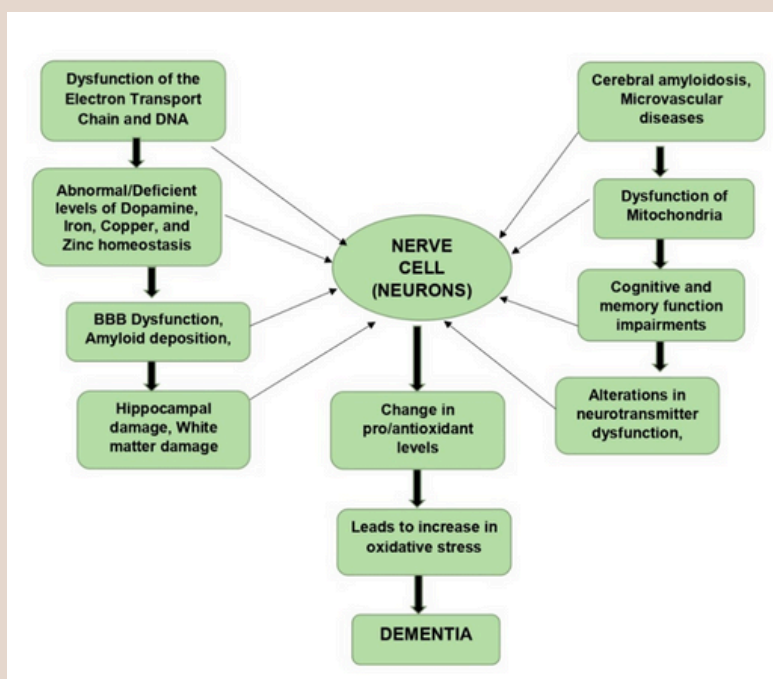


Figure 1. Pathophysiological factors that cause dementia

Table 1. Types of Dementias in elderly

Types of dementia	Occurrence	Features	Diagnostic tests
AD	55%–75% of cases	Gradual onset, worse progressively, clear consciousness, non-focal exam.	CT scan or MRI ApoE ε4 allele
Vascular	13%–16% of Cases	Cerebrovascular events and small vessel disease, Stepwise progression, Focal neurological exam.	CT or MRI

Lewy bodies	15%–35% of Cases	Features alpha-synuclein deposits, Cognitive fluctuations, Visual hallucinations.	Neuropsychological tests Functional imaging
Frontotemporal	Uncommon	Frontal and temporal lobe degeneration with protein inclusions like tau and TDP-43. Gradual onset, steady progression.	Neuropsychological tests Functional imaging
Mixed or Cerebral multimorbidity	-	Occurs with coexisting neuropathologies such as AD and CVD	CT or MRI Functional imaging Neuropsychological testing

#### 4. Biomarkers for diagnosis of neurodegeneration

Recent research has focused on the potential of blood-based indicators, such as neurofilament light chain and plasma phosphorylated tau, for detecting early brain degeneration. Elevated levels of these substances may signal the onset of dementia before symptoms appear. Blood tests are showing promise in identifying the underlying characteristics of Alzheimer's disease. In addition, cerebrospinal fluid markers, including amyloid beta and tau proteins, have been found to improve the accuracy of Alzheimer's disease diagnosis. Furthermore, retinal features, like the thickness of the retinal nerve fibre layer and macular size, are being explored as potential early indicators of dementia (10-12).

#### 5. Management and Treatment

Pharmacological options for addressing insomnia and dementia in elderly patients encompass short-acting benzodiazepines like lorazepam, neuroleptic agents such as haloperidol for managing agitation and paranoid symptoms, and antidepressants to address depressive symptoms. Although the use of psychostimulants like methylphenidate has shown promise in improving the condition of elderly patients, additional research is desired to validate its effectiveness. In managing dementia, both medication and non-pharmacological interventions are pivotal. Cholinesterase inhibitors like Donepezil and Rivastigmine work by increasing chemical messenger levels associated with memory and judgment. However, memantine regulates glutamate activity linked to learning and memory (13-15). Non-pharmacological interventions encompass physical exercise, Cognitive Stimulation Therapy and assistance with daily life activities through occupational therapy. Supportive care involves caregiver support, environmental modifications, and psychological counselling to help patients and families cope with the emotional aspects (16,17).

##### 5.1. Recent advancements

Recent advancements in the field of AD's research and treatment focused on several key areas where improved imaging techniques such as PET scans and MRI are being utilized to detect brain changes at an earlier stage. In addition, researchers are exploring the usage of biomarkers in cerebrospinal fluid and blood tests for early detection. Genetic research is another critical area of focus, with efforts aimed at understanding genetic risk factors and developing personalized treatments. In terms of medication ongoing trials are targeting amyloid plaques and tau tangles with an expansion of drugs focusing on neuroprotection and inflammation reduction showing potential for treating the disease. Lastly, lifestyle interventions, including research on the impact of diet such as the Mediterranean diet on cognitive health, as well as exploration of social and intellectual engagement as protective factors, are also being pursued to complement medical and technological advancements in the field (18,19).

## 5.2. Digital tools

The healthcare industry has leveraged technological advancements to enhance patient care, particularly through mobile applications that streamline management and expedite diagnostics. Digital tools such as AI-powered machine learning algorithms, smartphone apps, and wearable devices are increasingly employed in dementia detection. These tools can identify subtle cognitive and behavioural changes indicative of early-stage dementia. For instance, AI algorithms can predict Alzheimer's disease before symptom onset by analyzing brain scans (20). Additionally, apps like Sea Hero Quest assess spatial navigation skills, a common early dementia symptom. Wearable devices, including smartwatches and fitness trackers, monitor physical activity and sleep patterns, which are potentially early dementia indicators. Furthermore, game-based cognitive assessments, like those developed by BrainCheck, provide insights into executive function, cognitive processing, memory, and attention (21).

## 6. Conclusion

In conclusion, while dementia poses significant challenges, there are several symptom based treatments available. Clinicians should communicate hopefulness to patients and their families. Providing comprehensive evaluation, seeking reversible causes, and addressing treatable consequences such as depression are crucial.

## References

1. Ducharme F, Antoine P, Kergoat MJ, Coulombe R, Pasquier F. Caring for individuals with early-onset dementia and their family caregivers: the perspective of health care professionals. *Advances in Alzheimer's Disease*. 2014 Mar 12;3(01):33-43.
2. LoboPrabhu SM, Lomax JW, Molinari V. Supporting the caregiver in dementia: A guide for health care professionals. JHU Press; 2006 Jun 19.
3. LoGiudice D, Watson R. Dementia in older people: an update. *Internal medicine journal*. 2014 Nov;44(11):1066-73.
4. Dewing J, Dijk S. What is the current state of care for older people with dementia in general hospitals? A literature review. *Dementia*. 2016 Jan;15(1):106-24.
5. Arvanitakis Z, Bennett DA, Shah RC. Diagnosis and management of dementia. *Jama*. 2019 Oct 22;322(16):1589-99.
6. Cao Q, Xu W, Tan CC, Cao XP, Hu H, Tan L, Dong Q, Yu JT. The prevalence of dementia: a systematic review and meta-analysis. *Journal of Alzheimer's Disease*. 2020 Jan 1;73(3):1157-66.
7. Chin KS. Pathophysiology of dementia. *Australian Journal of General Practice*. 2023 Aug 1;52(8).
8. Kalaria RN. The pathology and pathophysiology of vascular dementia. *Neuropharmacology*. 2018 May 15;134:226-39.
9. Iemolo F, Rizzo C, Duro G, Hachinski V, Castiglia L, Caruso C. Pathophysiology of vascular dementia. *Immunity & Ageing*. 2009 Dec;6:1-9.
10. Bridel C, Zetterberg H, Van Wieringen WN, Teunissen CE, Tijms BM, Alvarez-Cermeño JC, Axelsson M, Bäckström DC, Andreasson U, Bartos A, Bjerke M. Diagnostic value of cerebrospinal fluid neurofilament light protein in neurology: a systematic review and meta-analysis. *JAMA neurology*. 2019 Sep 1;76(9):1035-48.
11. Murphy MP, LeVine H. Alzheimer's disease and the amyloid- $\beta$  peptide. *Journal of Alzheimer's disease*. 2010;19(1):311-23.
12. Cheung CY, Hilal S, Ikram MK, Ong YT, Low S, Ong YL, Venketasubramanian N, Yap P, Seow D, Chen CL, Wong TY. Retinal ganglion cell analysis using high-definition optical coherence tomography in patients with mild cognitive impairment and Alzheimer's disease. *Journal of Alzheimer's Disease*. 2015;45(1):45-56.
13. Burrows GD, Hunt D, Vohra J, Scoggins BA, Sloman JG, Davies B. Cardiac effects of different tricyclic antidepressant drugs. *The British Journal of Psychiatry*. 1976;129(4):335-41.
14. Maloney AJ, Davies P. Selective loss of central cholinergic neurons in Alzheimer's disease. *The Lancet*. 1976;308(8000):1403.
15. Perry EK, Blessed G, Bergmann K, Tomlinson BE, Perry RH, Gibson PH. Correlation of cholinergic abnormalities with senile plaques and mental test scores in senile dementia. *Br Med J*. 1978;2(6150):1457-9.
16. Sahakian BJ, Drachman DA. Memory and cognitive function in the elderly: a preliminary trial of physostigmine. *Archives of Neurology*. 1980;37(10):674-5.
17. Feinberg I, Heller N, Koresko RL. EEG sleep patterns as a function of normal and pathological aging in man. *Journal of psychiatric research*. 1967;5(2):107-44.
18. Jagust W. Imaging the evolution and pathophysiology of Alzheimer disease. *Nature Reviews Neuroscience*. 2018;19(11):687-700.
19. Ahmed RM, Warren JD, Paterson RW, O'Brien JT, Fox NC, Zetterberg H, Halliday GM, Schott JM. Biomarkers in dementia: clinical utility and new directions. *Journal of Neurology, Neurosurgery & Psychiatry*. 2014;85(12):1426-34.
20. Hafiz R, Ali A, Algarni GA, Alajlani L, Alammam OA, Ashqan MY, Aljurf H, Alkhashan A. The latest advances in the diagnosis and treatment of dementia. *Cureus*. 2023;15(12).
21. Burger C, Feller JA, Lopez MC, Baker HV, Mandel RJ, Muzyczka N. Changes in transcription within the CA1 field of the hippocampus are associated with age-related spatial learning impairments. *Neurobiology of learning and memory*. 2007;87(1):21-41.