

**THERAPEUTIC APPROACHES TO ALZHEIMER'S DISEASE: A SYSTEMATIC  
REVIEW****\*<sup>1</sup>Guduri Sri Padmavathi Pravallika, <sup>2</sup>Sreenu Thalla**<sup>1</sup>Department of Pharmacy Practice, ASN Pharmacy College, Burripalem Road, Tenali, Guntur, Andhra Pradesh, India – 522201.<sup>2</sup>Department of Pharmacology, Vignan Pharmacy College (Autonomous), Vadlamudi. Guntur, Andhra Pradesh, India – 522213.**\*Corresponding Author: Guduri Sri Padmavathi Pravallika**

Department of Pharmacy Practice, ASN Pharmacy College, Burripalem Road, Tenali, Guntur, Andhra Pradesh, India - 522201.

DOI: <https://doi.org/10.5281/zenodo.19884431>**How to cite this Article:** \*<sup>1</sup>Guduri Sri Padmavathi Pravallika, <sup>2</sup>Sreenu Thalla. (2026). Therapeutic Approaches To Alzheimer's Disease: A Systematic Review. European Journal of Pharmaceutical and Medical Research, 13(5), 149–155.  
This work is licensed under Creative Commons Attribution 4.0 International license.

Article Received on 04/04/2026

Article Revised on 25/04/2026

Article Published on 01/05/2026

**ABSTRACT**

Alzheimer's disease (AD) is a progressive neurodegenerative disorder and the leading cause of dementia worldwide. Despite extensive research, effective disease-modifying therapies remain limited. This systematic review evaluates current and emerging therapeutic strategies for AD, including symptomatic pharmacological treatments, disease-modifying approaches targeting amyloid and tau pathology, and novel interventions such as gene therapy, stem cell therapy, and nanotechnology-based drug delivery systems. A structured literature search (2020–2025) was conducted across major databases. Findings suggest that while conventional therapies provide symptomatic relief, recently approved monoclonal antibodies demonstrate only modest clinical benefits. Emerging multi-target strategies and early intervention approaches hold promise for future management. However, challenges such as late diagnosis, blood–brain barrier limitations, and clinical trial failures persist.

**KEYWORDS:** Alzheimer's disease, amyloid beta, tau protein, monoclonal antibodies, neurodegeneration, therapeutic strategies.**INTRODUCTION**

Alzheimer's disease is characterized by progressive cognitive decline, synaptic dysfunction, and neuronal loss. The pathological hallmarks include extracellular amyloid- $\beta$  plaques and intracellular neurofibrillary tangles composed of hyperphosphorylated tau protein. Additional contributing factors include oxidative stress, mitochondrial dysfunction, and neuroinflammation.<sup>[1]</sup>

Despite advances in understanding disease mechanisms, translation into effective therapies has been limited, necessitating a comprehensive evaluation of current and emerging approaches.

**METHODOLOGY****2.1 Search Strategy**

A systematic search was conducted in PubMed, Scopus, Web of Science, and ScienceDirect (2020–2025). Keywords included: "Alzheimer's disease," "therapy,"

"amyloid," "tau," "immunotherapy," and "drug delivery."

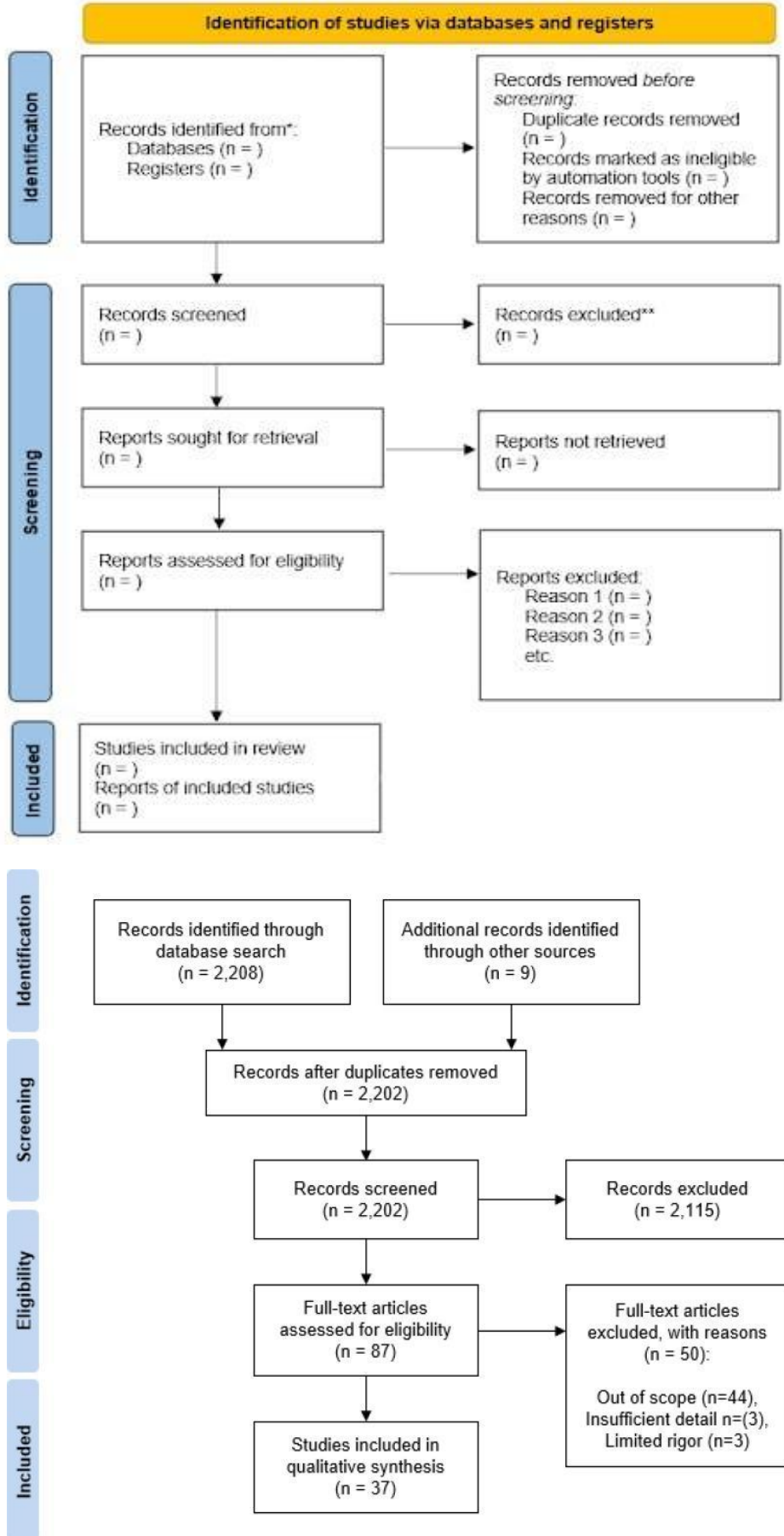
**2.2 Inclusion Criteria**

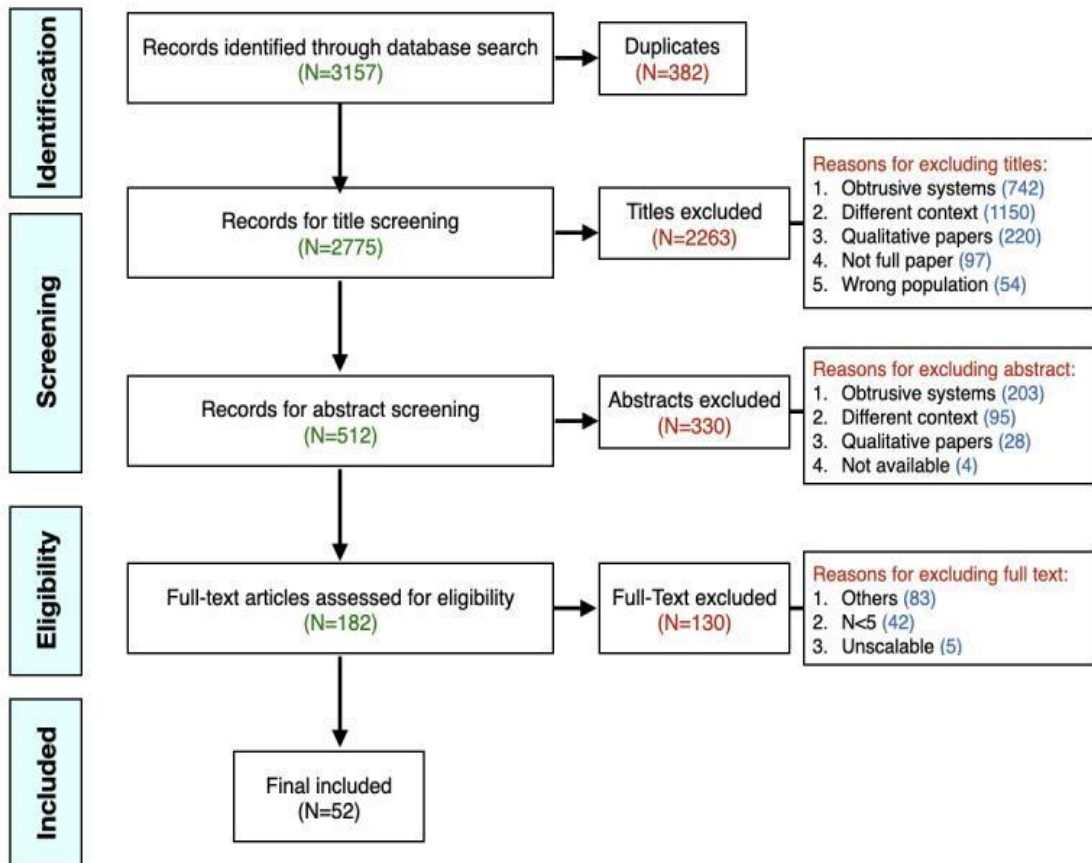
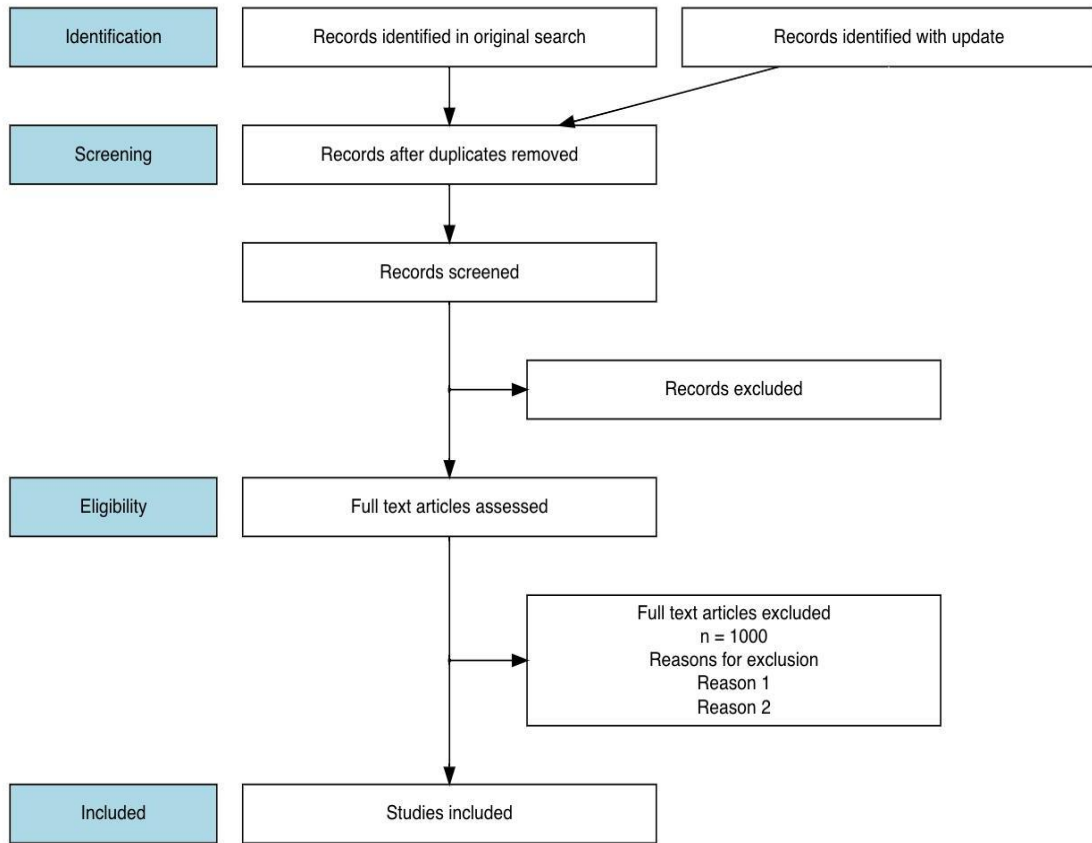
- Peer-reviewed articles
- Clinical trials, systematic reviews, meta-analyses
- English language

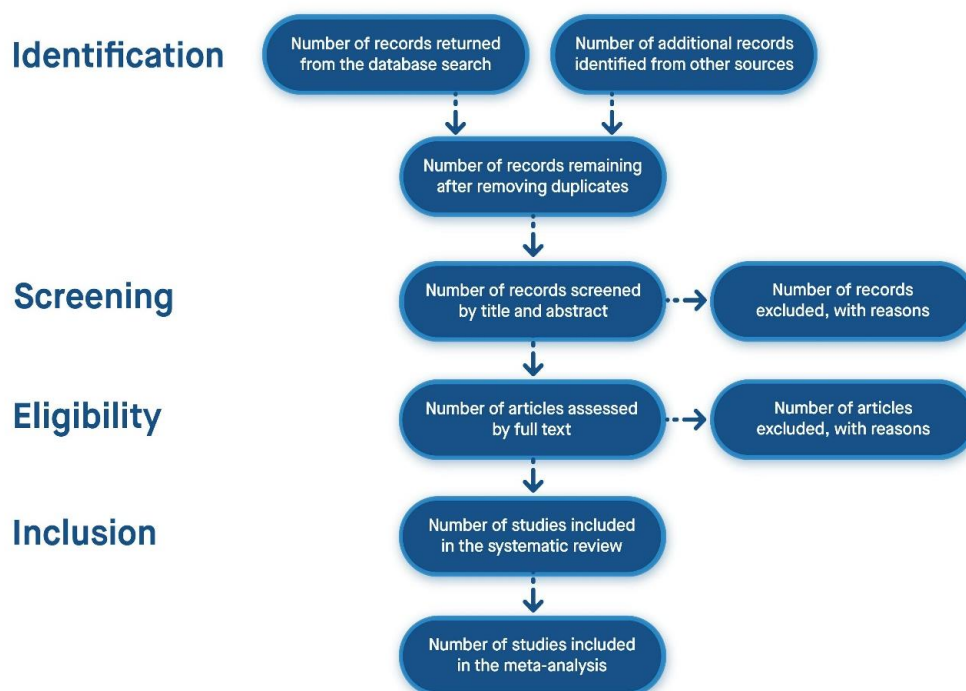
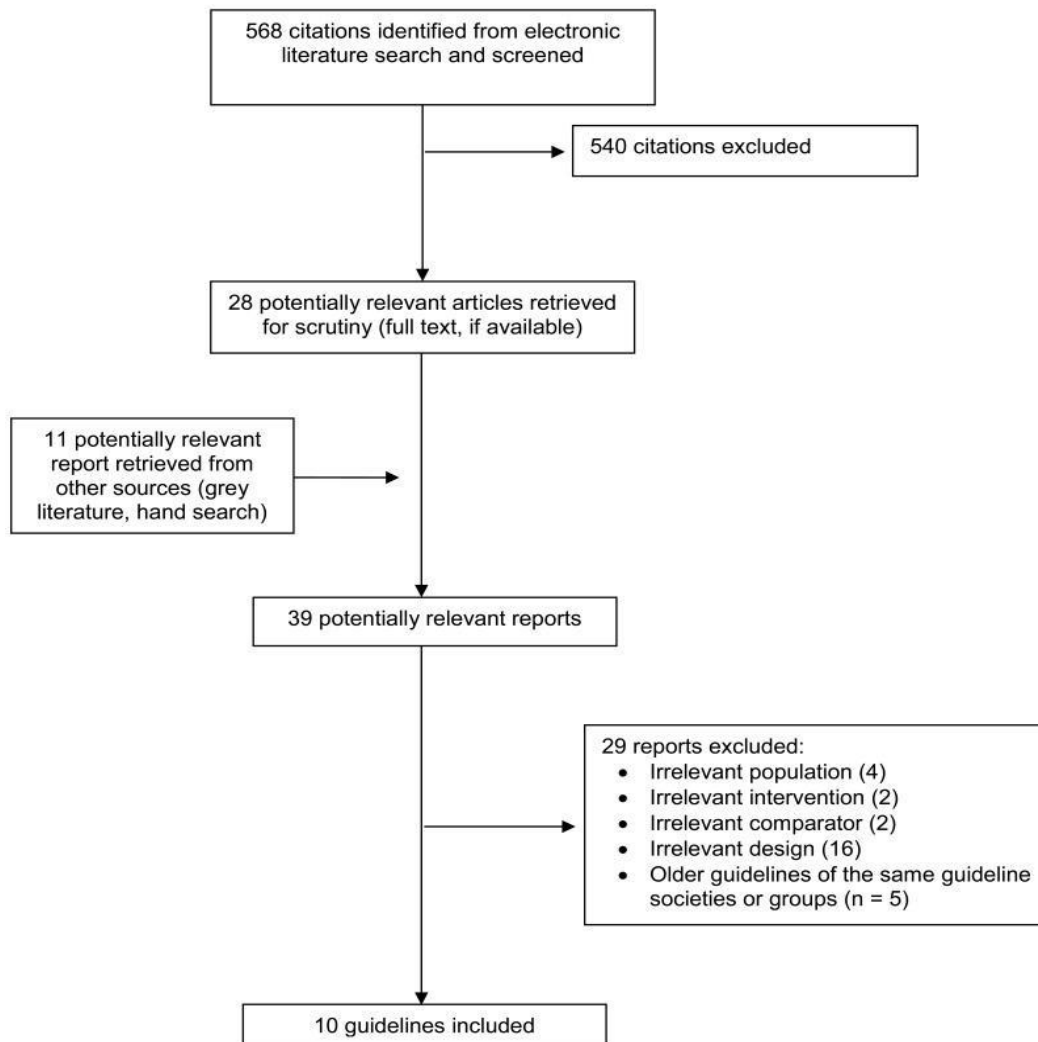
**2.3 Exclusion Criteria**

- Case reports
- Non-peer-reviewed sources
- Studies before 2020

PRISMA Flow Diagram







PRISMA flow diagram illustrating study selection process.

**Textual Summary**

- Records identified: 1,245
- After duplicates removed: 980
- Screened: 980
- Full-text assessed: 210
- Included in review: 75

**Pathophysiological Targets**

Therapeutic strategies in AD are based on multiple hypotheses:

- Amyloid cascade hypothesis
- Tau propagation hypothesis
- Cholinergic dysfunction
- Glutamate excitotoxicity
- Neuroinflammation

The multifactorial nature of AD explains why single-target therapies often fail.<sup>[2]</sup>

**Therapeutic Approaches**

**Symptomatic Treatments**

Drug Class	Examples	Mechanism	Clinical Outcome
Acetylcholinesterase inhibitors	Donepezil, Rivastigmine	Increase acetylcholine	Mild cognitive improvement
NMDA receptor antagonist	Memantine	Reduces excitotoxicity	Moderate symptom control

**Disease-Modifying Therapies**

Therapy Type	Example Drugs	Target	Key Outcome
Anti-amyloid antibodies	Aducanumab, Lecanemab	Amyloid plaques	Modest slowing
Anti-tau therapies	Semorinemab	Tau protein	Limited success

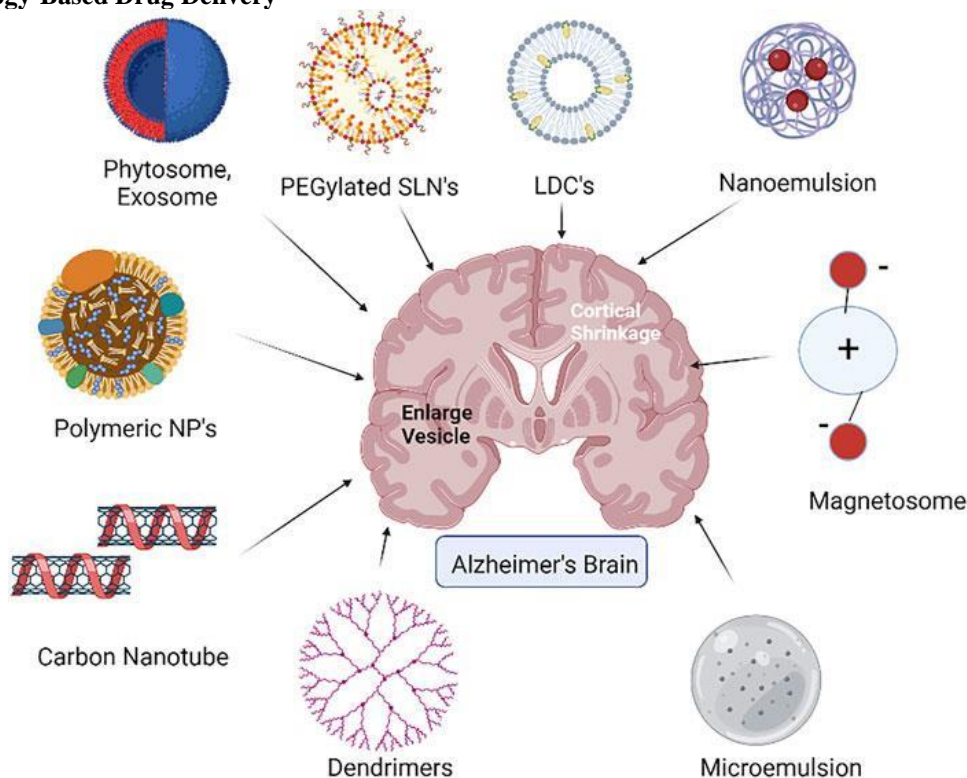
**Emerging Therapeutic Strategies**

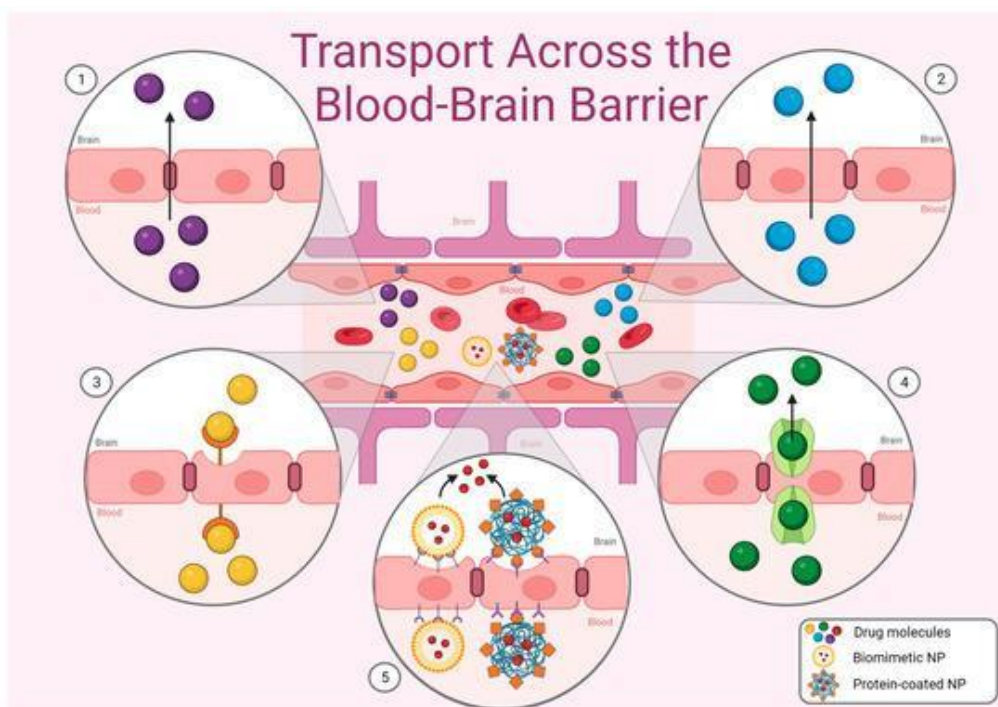
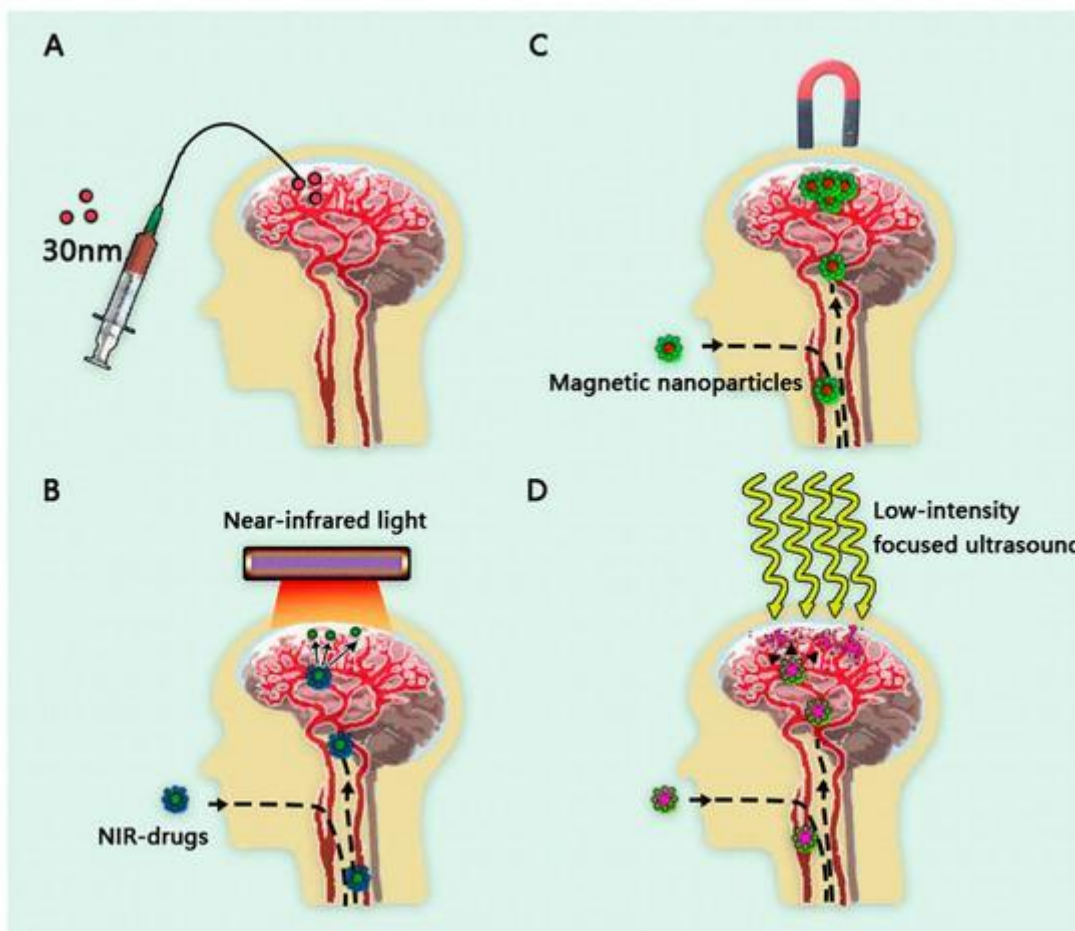
**Multi-Target Drugs** - Designed to act on multiple pathological pathways simultaneously, improving therapeutic efficacy.

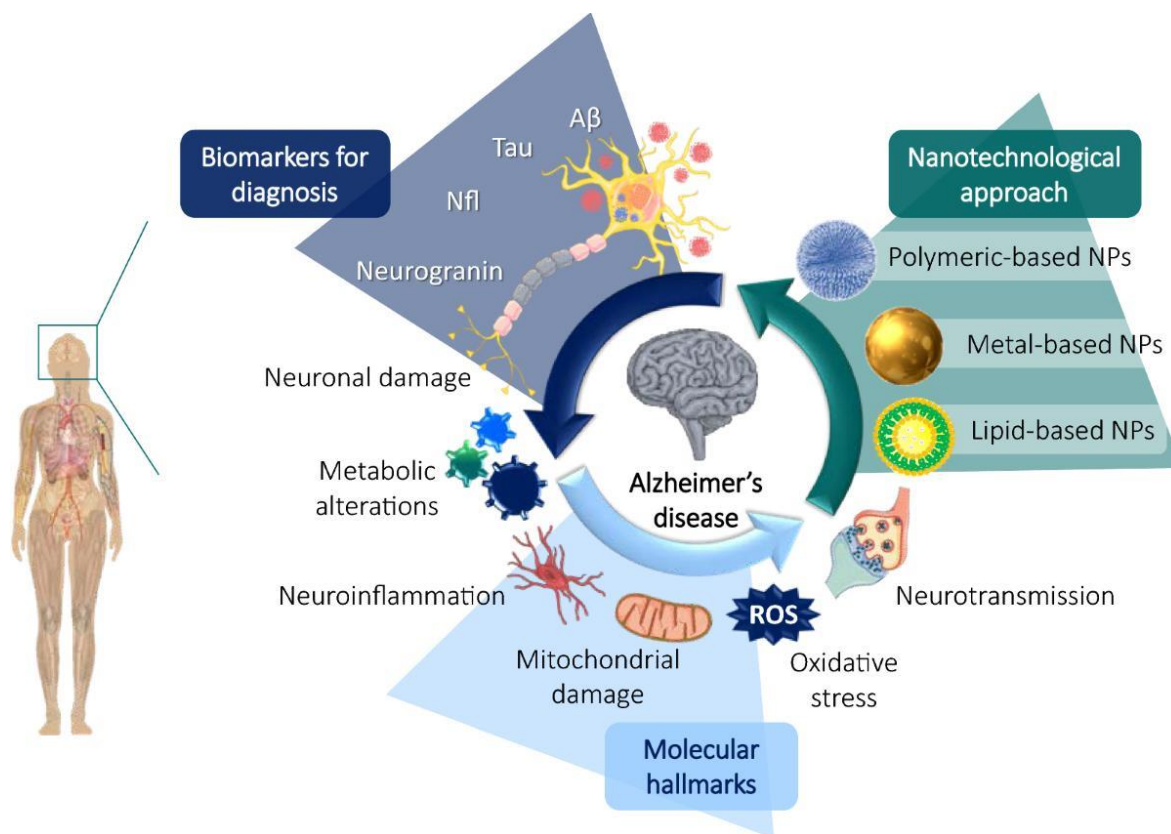
**Stem Cell Therapy** - Promotes neuronal regeneration and synaptic repair; currently in preclinical/early clinical stages.

**Gene Therapy** - Targets genetic risk factors such as APOE4, aiming to modify disease progression.

**Nanotechnology-Based Drug Delivery**







### Non-Pharmacological Interventions

- Cognitive training
- Physical activity
- Dietary modifications (Mediterranean diet)
- Social engagement

These approaches improve quality of life but do not significantly alter disease progression.

### Challenges in Alzheimer's Therapy

- Blood–brain barrier restricts drug access
- Late-stage diagnosis
- High clinical trial failure rate
- Adverse effects of immunotherapies
- Heterogeneity of disease mechanisms

### Future Perspectives

- Precision medicine using biomarkers
- Combination therapies
- Early intervention strategies
- AI-driven drug discovery
- Preventive approaches

### CONCLUSION

- Although significant progress has been made in understanding Alzheimer's disease, therapeutic success remains limited. Current treatments are largely symptomatic, and recently developed disease-modifying therapies provide only modest benefits. Future research should prioritize early diagnosis, multi-target strategies, and personalized medicine to improve clinical outcomes.

### REFERENCES

1. Zhang J, et al. Recent advances in Alzheimer's disease research. *Signal Transduct Target Ther.*, 2024; 9: 115.
2. Fox NC, et al. Treatment strategies for Alzheimer's disease. *Lancet.*, 2025; 405: 123–134.
3. Wu CK, et al. Advances in Alzheimer's therapeutics. *J Alzheimers Dis.*, 2025; 89: 455–470.
4. Singh B, et al. Nanotechnology in Alzheimer's therapy. *Int J Pharm.*, 2024; 620: 121–135.
5. Sharma A, et al. Drug development for AD. *Med Chem.*, 2025; 21: 89–102.
6. Xiao D, et al. Current pharmacological treatments. *Explor Neuroprot Ther.*, 2024; 4: 210–225.
7. GVR Reddy, S Thalla - Multi-Factorial Approach as a Therapeutic Strategy for the Management of Alzheimer's Disease, Springer Nature, 2025; 177-198.