

How Metabolic and Cardiovascular Diseases Influence Alzheimer’s Disease Risk and Progression



Welisarage Mary Kendrea Thisangee Fernando¹, Lahiru S. Perera², Ranil COOREY³, B.G.D.N.K De Silva⁴, Ralph N. Martins² Warnakulasuriya Mary Ann Dipika Blnosha Fernando²

1 Curtin Medical School, Curtin University, Perth, Australia, 2 Centre of Excellence for Alzheimer’s Disease Research & Care, School of Medical and Health Sciences, Edith Cowan University, Joondalup, WA, Australia, 3 School of Molecular and Life Sciences, Curtin University, Perth, Australia, 4 Sri Jayawardenapura University, Jayawardenapura, Sri Lanka

Early detection and management of diabetes and cardiovascular risk factors may help prevent or delay the onset of Alzheimer’s disease

INTRODUCTION

- Alzheimer’s disease (AD) is a progressive neurodegenerative disorder influenced by systemic metabolic and vascular health [1]
- Type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD) are major modifiable risk factors for cognitive decline related to dementia [1].
- T2DM, CVD, and AD share overlapping mechanisms including insulin resistance, chronic inflammation, oxidative stress, endothelial dysfunction, and impaired cerebral perfusion [2].
- Understanding how metabolic and cardiovascular conditions contribute to AD pathogenesis is important for prevention and early intervention [2]

OBJECTIVE

To summarise current evidence on how type 2 diabetes mellitus and cardiovascular disease influence Alzheimer’s disease risk and progression, with emphasis on shared mechanistic pathways, neuroimaging findings, biomarkers, and cognitive outcomes

KEYWORDS

Alzheimer’s disease; Type 2 diabetes mellitus; Cardiovascular disease; Cognitive decline; Neurodegeneration; Vascular risk; Amyloid-β; Tau

METHODS

- Databases searched: PubMed, Scopus, and Web of Science
- Search terms: diabetes, cardiovascular disease, vascular risk factors, Alzheimer’s disease, cognition, neuroimaging, biomarkers, and mechanisms
- Included studies: cognitive outcomes, neuroimaging findings, biomarkers, and shared pathophysiological pathways
- Focused on associations between T2DM, CVD, and AD risk and progression

RESULTS

Epidemiological evidence

- T2DM and CVD independently increase the risk of developing AD
- When present together, metabolic and vascular disease may act synergistically to accelerate cognitive decline

Diabetes related mechanisms

- Impaired brain insulin signalling
- Altered cerebral glucose metabolism
- Increased amyloid-β accumulation
- Increased Tau hyperphosphorylation

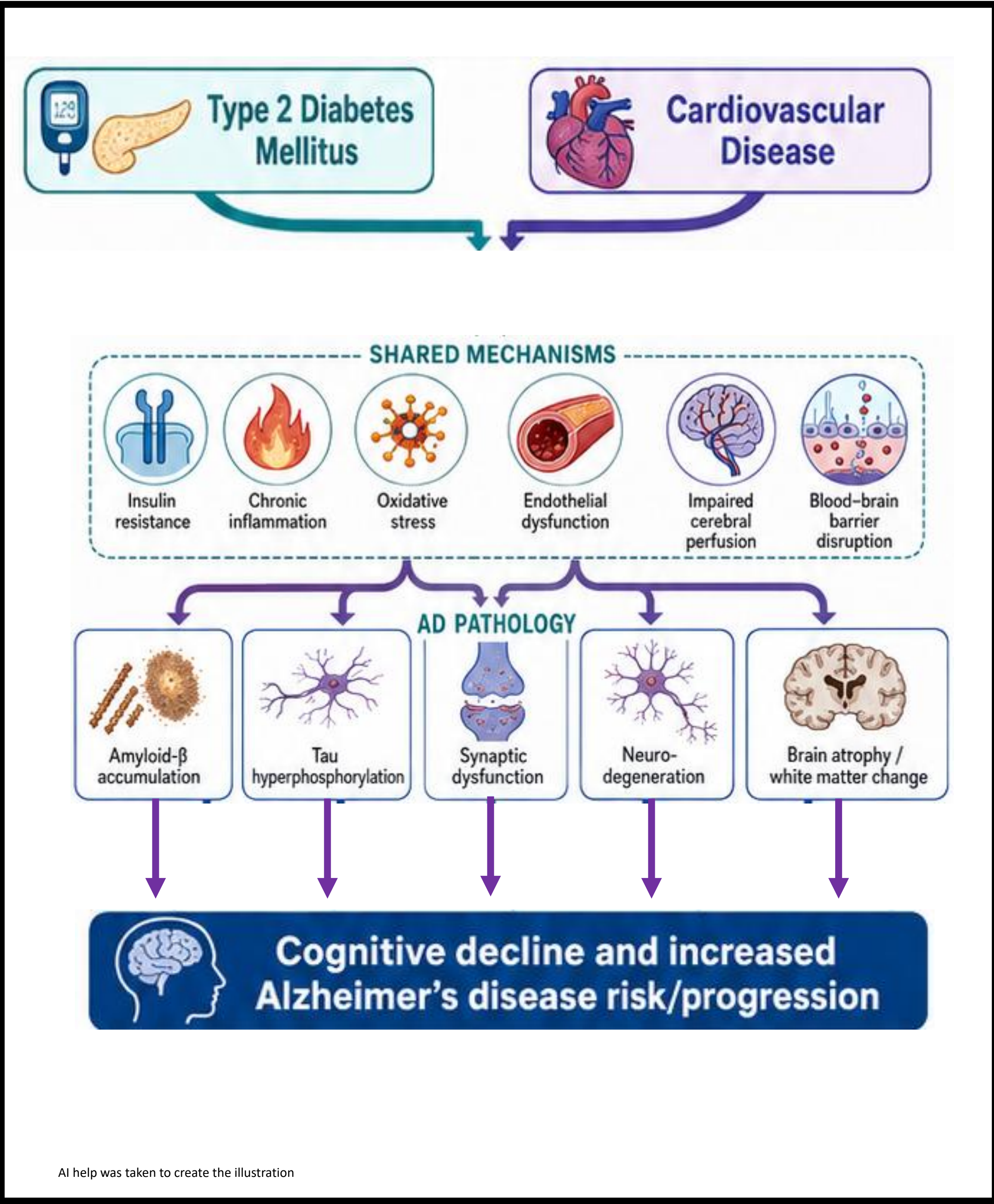
Cardiovascular related mechanisms

- Cerebral hypoperfusion
- Blood brain barrier dysfunction
- Endothelial dysfunction and vascular injury
- Exacerbation of neurodegeneration and cognitive impairment

Epidemiological evidence

- Metabolic and vascular dysfunction are associated with significant brain atrophy
- White matter changes are more common in affected individuals
- Increased amyloid burden can be detected even in cognitively unimpaired individuals

CONCEPTUAL MECHANISTIC PATHWAY



CLINICAL IMPLICATIONS

- T2DM and CVD are potentially modifiable contributors to AD risk
- Early identification of metabolic and vascular dysfunction may support dementia prevention strategies
- Management of glucose control, vascular health, and cardiovascular risk factors may help reduce or delay AD onset and progression
- Multidomain prevention approaches are important

CONCLUSIONS

- Diabetes and cardiovascular disease play important roles in modulating Alzheimer’s disease risk and progression through interconnected metabolic and vascular pathways
- Evidence from epidemiological, mechanistic, neuroimaging, and biomarker studies supports this relationship
- Early detection and management of diabetes and cardiovascular risk factors may help prevent or delay the onset of AD

REFERENCES

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CONTACT



Welisarage Mary Kendrea Thisangee Fernando
Curtin Medical School, Curtin University, WA
22306243@student.curtin.edu.au