Universal Journal of Public Health 13(6): 1509-1521, 2025 http://www.hrpub.org
DOI: 10.13189/ujph.2025.130611

Risk Factors, Early Detection, and Management of Dementia in the Geriatric Population: A Comprehensive Narrative Review

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Received June 18, 2025; Revised September 20, 2025; Accepted October 14, 2025

Cite This Paper in the Following Citation Styles

(a): *[1] Amir Ishaq Alshizawi, Ibrahim Mustufa Topiwala, Prasanna Appiya Premvignesh, Abubakker Siddiq Mohamed Hameed, Latifa Nabeel Alsaad, Jayadevan Sreedharan, Jayakumary Muttappallymyalil, "Risk Factors, Early Detection, and Management of Dementia in the Geriatric Population: A Comprehensive Narrative Review," Universal Journal of Public Health, Vol. 13, No. 6, pp. 1509 - 1521, 2025. DOI: 10.13189/ujph.2025.130611.*

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Abstract Dementia is a progressive neurodegenerative disorder and a major public health challenge in aging populations. Its origins are multifactorial, involving genetic, vascular, metabolic, and psychological factors. Increasing age is the leading unchangeable risk factor for dementia, with a marked rise in incidence observed in individuals older than 65, especially with each subsequent five-year interval. The APOE ε4 allele further increases susceptibility, though its full impact remains incompletely understood. In contrast, modifiable lifestyle factors—such as physical activity, education, and social engagement—can reduce risk and delay onset. Early detection remains a critical challenge, as mild cognitive impairment often goes unrecognized. While neuroimaging and biomarkers offer diagnostic potential, their high cost and limited accessibility hinder widespread adoption, especially in underserved regions. Emerging technologies, including AI-driven tools and mobile applications, show promise for scalable early detection, though their integration must be carefully managed to complement clinical judgment and human care. Management typically combines pharmacological treatments, such as cholinesterase inhibitors, with non-pharmacological approaches, including cognitive therapy and psychosocial support. However, dementia imposes a substantial burden on caregivers—emotional, physical, and financial—underscoring the urgent need for robust and sustainable support systems. This review highlights the importance of a multidisciplinary approach to dementia care, integrating prevention, early diagnosis, and individualized management strategies to improve outcomes for both patients and caregivers.

Keywords Dementia, Geriatric Population, Risk Factors, Early Detection, Dementia Management, Multidisciplinary Care, Neurodegenerative Disorders

1. Introduction

Dementia is a progressive neurocognitive disorder that leads to declining memory, impaired cognition, and loss of functional independence, particularly in older adults. Its impact extends beyond clinical symptoms, often resulting in a significant reduction in quality of life (QoL). With aging populations and the absence of curative treatments, dementia has become a major public health concern [1]. The condition encompasses several etiologies, most commonly Alzheimer's disease, followed by vascular, frontotemporal, and Lewy body dementias. According to DSM-5, dementia involves 13 distinct causes, underscoring its clinical complexity [2].

The global burden is projected to rise steeply, with 115–131 million cases expected by 2050, most in low- and middle-income countries [5,7]. This increase imposes immense challenges on healthcare systems, caregivers, and families, with costs already reaching billions annually through direct medical care and indirect productivity losses [4]. Despite growing awareness, delayed diagnosis and limited treatment access continue to exacerbate the personal and societal impact [3,6].

Advancing age remains the most significant non-modifiable risk factor, with the likelihood of developing dementia approximately doubling with every five-year increase after the age of 65 [8–11]. Still, aging alone is insufficient; susceptibility depends on both non-modifiable risks, such as APOE ε4 and prior traumatic brain injury, and modifiable determinants including cardiovascular health, education, diet, physical activity, and toxin exposure [12,13]. Chronic conditions like hypertension, diabetes, and obesity, along with social isolation and poor healthcare access, further elevate risk. Public health strategies targeting these modifiable factors can reduce incidence [14,15].

Early detection is critical but remains difficult. Mild cognitive or behavioral changes are often dismissed as normal aging, delaying intervention. Advances in neuroimaging, biomarkers, and cognitive testing—such as the Mini-Mental State Examination and Montreal Cognitive Assessment—improve diagnostic accuracy, yet their application is constrained by cost and accessibility, especially in low-resource settings [16].

Management combines pharmacologic and non-pharmacologic strategies [5,7]. While no curative therapy exists, cholinesterase inhibitors and memantine alleviate cognitive symptoms, while antipsychotics and antidepressants address behavioral complications [7,17–21]. Equally vital are non-pharmacologic measures—cognitive stimulation, exercise, social engagement, and caregiver support, which mitigate decline and reduce caregiver burden.

This review examines dementia in the geriatric population by synthesizing evidence on risk factors, early detection, and management. By highlighting current gaps and emerging strategies, it aims to inform interventions that reduce the burden and improve QoL for patients and caregivers.

2. Methods

This review adopted a narrative design to synthesize evidence across biomedical, psychological, and social dimensions of dementia. A narrative framework was chosen because the heterogeneity of study designs and outcomes precluded quantitative meta-analysis, while still allowing for thematic integration.

2.1. Search Strategy and Databases

A purposive literature search was conducted in PubMed, Scopus, and Google Scholar, covering January 2019–April 2025. Search strings combined key terms (e.g., "dementia," "cognitive decline," "risk factors," "early detection," "management," "geriatric"). Additional studies were identified by manually reviewing the reference lists of relevant articles.

2.2. Selection Criteria

Publications were included if they: (i) were in English, (ii) focused on dementia and addressed at least one of the following: risk factors, early detection, management, or caregiver burden. Preclinical studies, non-English publications, and case reports were excluded. Instead of aiming for exhaustive inclusion, the selection prioritized representative and high-quality studies to ensure a balanced synthesis of both scope and depth.

2.3. Selection and Screening Process

Authors independently screened and summarized literature within assigned domains (risk factors, detection, management, QoL). Findings were discussed collaboratively to ensure thematic integration. Data were synthesized narratively, emphasizing conceptual trends, key evidence, and clinical implications rather than statistical pooling. Any disagreements in article selection were resolved through consensus discussions among the authors.

2.4. Data Extraction and Synthesis

Key information, including study design, population, primary findings, and measurement tools, was extracted from each included study. Data were summarized narratively, and no meta-analysis or statistical pooling was performed. A thematic synthesis approach was used to integrate findings across biomedical, psychological, and social domains, reflecting the multifactorial nature of dementia.

2.5. Limitations

This review did not apply the PRISMA methodology or formal bias assessment tools, given its narrative design. Nevertheless, efforts to minimize bias included multi-database searching, explicit eligibility criteria, independent screening, and manual duplicate removal.

Figure 1 illustrates a flowchart outlining the process used for selecting articles included in this review.

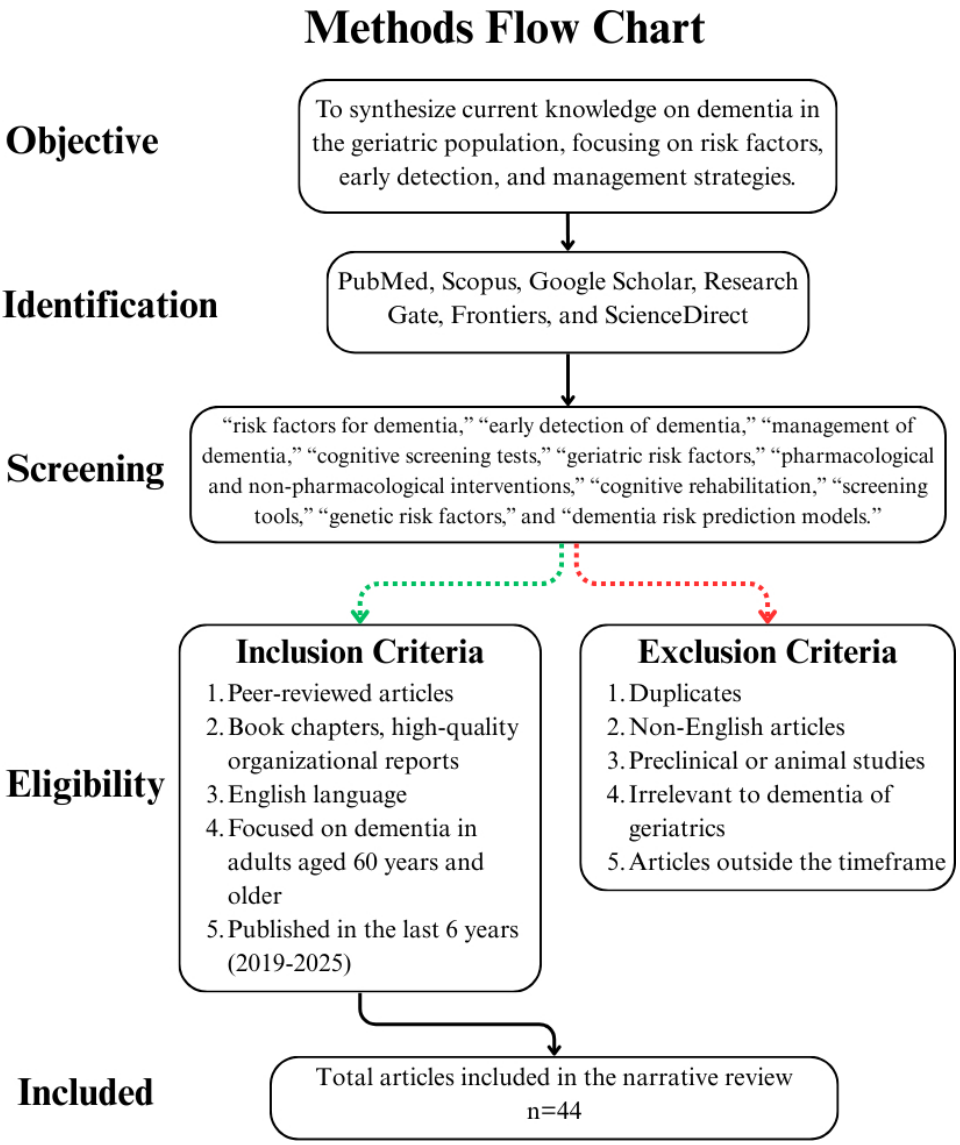

Figure 1. Methodology flowchart summarizing literature search strategy, inclusion/exclusion criteria, and data synthesis steps used in the review

3. Result

3.1. Risk Factors for Dementia

Identification and understanding of dementia risk factors are vital to prevention strategies that increase quality of life and delay disease onset. This section synthesizes findings from multiple studies, examining biological, psychological, social, and lifestyle contributors, along with their mechanisms and clinical implications.

Age is the most significant risk factor for dementia, with each advancing year increasing dementia risk by approximately 16% [10,11,14]. Demographic variables such as gender (particularly older females), race, and socioeconomic status also influence prevalence [8,9,12,14]. Individuals from lower socioeconomic backgrounds or minority racial groups often face greater risk due to disparities in healthcare access, education, and health literacy [12,14]. Addressing these inequities through community-based interventions and improved preventive care is crucial.

Genetic predisposition, particularly the APOE ε4 allele, significantly elevates Alzheimer's disease risk by promoting amyloid plaque accumulation and impairing lipid transport [10,11,13,14]. Although non-modifiable, genetic screening can help personalize preventive strategies.

Vascular health significantly influences dementia risk. The Framingham Heart Study identified hypertension, diabetes, and stroke as critical predictors [12]. A population-based study involving over 4 million participants found that individuals diagnosed with diabetes mellitus in midlife had a significantly higher risk of developing dementia (HR = 4.31; 95% CI: 3.98–4.67). The large cohort size and consistent risk estimate enhance confidence in the validity of this association. Hypertension increased risk by 12% (HR = 1.12; 95% CI: 1.05–1.20), suggesting a modest yet statistically significant effect, while atrial fibrillation nearly doubled it (HR = 1.95; 95% CI: 1.62–2.34). The most substantial vascular predictor was stroke, conferring over a threefold increase in dementia risk (HR = 3.61; 95% CI: 2.69–4.83). The consistency and tight bounds of these confidence intervals across millions of participants enhance the reliability of these findings and underscore the importance of vascular health as a modifiable risk domain. Managing these conditions through blood pressure regulation, glucose control, and cardiovascular monitoring remains a cornerstone of reducing dementia incidence.

Metabolic conditions such as poorly controlled or long-standing type 2 diabetes mellitus (T2DM) may quadruple dementia risk [9,10]. Obesity contributes through neuroinflammation and leptin resistance, impairing neuroprotection and promoting amyloid and tau pathology [13]. Preventive efforts focused on weight control, regular exercise, and healthy diets may lower these risks by improving metabolic and neurological health.

Psychological conditions, particularly depression and post-traumatic stress disorder (PTSD), are also important contributors to dementia risk [8,10,12]. A study examining depression severity found that patients with severe depression had dramatically elevated odds of dementia (OR = 13.6; 95% CI: 1.07–172.89), while those with moderate depression had an OR of 15.6 (95% CI: 3.32–73.01) [10]. However, the extremely wide confidence intervals and smaller sample sizes in these studies suggest less precision and caution in interpretation. In contrast, PTSD's association with dementia is better established; a meta-analysis showed a pooled HR of 1.61 (95% CI: 1.46–1.78), rising to 2.11 (95% CI: 1.67–2.66) in general population studies, offering stronger and more consistent statistical confidence. These findings not only highlight the neurobiological effects of chronic psychological stress, such as hippocampal atrophy and HPA axis dysregulation, but also emphasize the clinical need for early psychiatric interventions to reduce long-term neurodegenerative risk. PTSD-related brain changes, such as hippocampal atrophy and overactivation of the hypothalamic-pituitary-adrenal (HPA) axis, contribute to cortisol elevation and oxidative stress, worsening cognitive deterioration [8]. Early intervention through cognitive behavioral therapy (CBT) and pharmacological treatments may help mitigate these psychological contributors.

Sensory impairments, such as hearing and vision loss, are now recognized as modifiable dementia risk factors [12,15]. Hearing loss independently accounts for about 8% of all dementias globally, and visual impairment contributes to risk as well [15]. These conditions reduce cognitive stimulation, promote social isolation, and accelerate cognitive decline [12,15]. Interventions like hearing aid use or cataract surgery can help restore sensory input, potentially supporting cognitive function and slowing the trajectory of decline.

Lifestyle factors are also central to the development of dementia. Physical inactivity, smoking, poverty, and social isolation all increase risk [9,12]. Inactivity reduces neurogenesis and cerebral blood flow, but increases inflammation. In contrast, consistent engagement in physical activity has been shown to reduce dementia risk, with evidence supported by long-term observational studies such as the Framingham Heart Study [9]. Smoking further exacerbates neurodegeneration via oxidative stress and vascular injury [12]. Loneliness and social isolation reduce cognitive resilience and enhance psychological distress and hence make individuals more susceptible [12,14]. Addressing these factors through health promotion, smoking cessation campaigns, and social integration programs is vital in risk reduction.

At the mechanistic level, multiple neurobiological pathways link these risk factors to dementia progression. Rather than acting in isolation, dementia risk factors converge on shared neurobiological mechanisms. Chronic

stress, metabolic dysfunction, and vascular injury intersect to accelerate hippocampal atrophy, oxidative stress, and neuroinflammation, ultimately driving cognitive decline [8,13]. This convergence suggests that preventive strategies targeting overlapping pathways may yield a greater impact than addressing single risk factors in isolation.

Dementia arises from a complex interaction of biological, psychological, and social factors, reflecting the condition's multifaceted nature. Recognizing these interconnected pathways provides a rationale for advancing early detection tools and risk prediction models, which can translate mechanistic insights into clinical prevention strategies.

3.2. Risk Prediction Models

Risk prediction models help pinpoint individuals more likely to develop dementia, allowing for timely intervention and preventive planning. These models combine data from genetics, lifestyle habits, vascular health, and brain imaging to assess the likelihood of future cognitive impairment [13]. The CAIDE Dementia Risk Score evaluates long-term risk in midlife based on education, hypertension, obesity, and inactivity [13], while the Framingham Stroke Risk Profile (FSRP) links diabetes, atrial fibrillation, and systolic blood pressure to later cognitive decline [9]. Neuroimaging and biomarkers, such as white matter integrity, further enhance prediction, and the APOE ε4 allele strengthens accuracy by capturing genetic susceptibility [11,13]. These models illustrate the interaction of modifiable and non-modifiable risks, reinforcing the importance of managing midlife conditions such as hypertension and diabetes to prevent late-life cognitive decline [11,13]. Personalized assessments that consider age, sex, and comorbidities increase the relevance of intervention [12,13]. As research advances, the integration of vascular, genetic, and neuroimaging data is expected to enhance the accuracy of predictive models, aligning with global initiatives aimed at reducing dementia incidence. This approach reflects the evolving emphasis on proactive, prevention-oriented strategies in dementia care [8,11].

Landmark studies such as the Framingham Heart Study and the CAIDE risk models have provided critical insights into the relationship between midlife vascular risk factors and dementia onset. However, important methodological constraints warrant caution when generalizing their findings. Cohort populations in these studies are often racially and geographically homogenous, limiting external validity across diverse, multi-ethnic populations. Longitudinal designs, while valuable, introduce survivor bias by disproportionately reflecting healthier individuals who live long enough to undergo cognitive assessments. Moreover, publication bias may contribute to an overrepresentation of significant associations, distorting the overall evidence base. These limitations highlight the need for more recent, multi-center studies with broader sociodemographic representation to strengthen global applicability and refine dementia risk prediction.

3.3. Early Detection of Dementia: Importance and Methods

Early detection, particularly of Mild Cognitive Impairment (MCI)—which affects 10–20% of adults aged 65 and above is crucial. Identifying MCI can delay dementia progression and potentially reduce its prevalence by up to 43% by 2050 [5].

3.3.1. Importance of Early Detection

Early detection is essential as it allows for timely interventions that may slow cognitive decline and improve disease management. Communication difficulties often emerge in the early stages, making conversational analysis a promising diagnostic tool. However, conventional assessments are often time-consuming and resource-intensive, emphasizing the need for automated, cost-effective, and accurate tools [3].

Detecting dementia early, particularly Alzheimer's Disease (AD), supports symptom control, lifestyle changes, and risk reduction. It also helps identify comorbid symptoms like depression, anxiety, and sleep disturbances, improving diagnostic accuracy [7,22].

MCI frequently precedes AD, making its identification critical for predicting progression. Early diagnosis facilitates medical planning, enrollment in clinical trials, and access to support programs. It also alleviates caregiver stress by connecting families to appropriate resources and improving care quality [22].

Moreover, early recognition enables preventive strategies like cognitive training and lifestyle changes. It empowers families to make informed decisions about care and legal planning [5,23]. At a systemic level, it helps allocate resources efficiently and reduces the burden on healthcare systems. Understanding early-stage dementia is also vital for advancing research, developing therapies, and identifying biomarkers and risk factors [6].

3.3.2. Current Approaches to Early Detection

The Clinical Evaluation

A thorough clinical evaluation remains essential for assessing cognitive decline, typically incorporating detailed medical history and caregiver input. Cognitive measures such as the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Exam (MMSE) are widely employed tools in the evaluation of cognitive function. MoCA is especially effective in detecting Mild Cognitive Impairment (MCI), while MMSE has lower sensitivity in such cases [7].

3.3.3. Cognitive Screening Tools: A Vital Component

Structured screening tools are necessary for the

identification of individuals at risk. While the Mini-Mental State Examination (MMSE) is widely used in clinical practice, its ability to detect subtle deficits in the early stages of dementia is limited. It evaluates orientation, attention, memory, language, and visuospatial abilities, with a common cutoff score of 23/24 indicating impairment [4,5]. In contrast, the Montreal Cognitive Assessment (MoCA) is specifically designed for identifying mild cognitive impairment (MCI) and early Alzheimer's disease. It evaluates a broader range of cognitive domains through 11 components, including executive functioning, memory, visuospatial skills, attention, and language. The conventional cutoff score of ≥26 reflects normal cognition. Validation studies on the Argentine MoCA adaptation (MoCA-A) reported a sensitivity of 84.8% and specificity of 74.4% for MCI, along with 100% sensitivity and 87.8% specificity for mild dementia [5,23]. However, while MoCA's sensitivity is consistently high, specificity can vary, especially in low-prevalence settings, raising the possibility of false positives. Factors such as educational level, age, and cultural background can influence performance, highlighting the importance of population-specific adaptations and interpretation.

However, the use of a universal MoCA cutoff score of ≥26 remains problematic across diverse populations, particularly those with limited education or low literacy levels. Studies have shown that this threshold may lead to overdiagnosis of cognitive impairment in older adults from non-Western or low-resource settings. To address this, several culturally and linguistically adapted versions such as MoCA-Basic, MoCA-Chinese, and MoCA-Arabic have been developed with adjusted cutoff scores and simplified item structures. These adaptations improve diagnostic validity by accounting for socioeconomic and educational variability, thereby minimizing false positives and enhancing the global applicability of the MoCA tool.

This discrepancy between high sensitivity and variable specificity reflects a critical trade-off in cognitive screening: while tools like MoCA are adept at identifying early cognitive decline, they may also yield false positives, particularly in populations with lower educational attainment [23]. In contrast, MMSE offers higher specificity in later-stage dementia but underperforms in detecting MCI, leading to false negatives [24]. This underscores the need to align tool selection with clinical intent, whether prioritizing early detection or minimizing overdiagnosis, while accounting for cultural, linguistic, and educational variables.

Educational level is a key determinant of MoCA performance. Several validation studies recommend adjusting the MoCA cutoff or scoring to account for education-related variance, which otherwise reduces specificity. For instance, the MoCA-Argentinian version (MoCA-A) adopted localized scoring norms for older adults with limited education, improving diagnostic accuracy without over-identifying false positives [25]. Similarly, the Chinese version of MoCA demonstrated better sensitivity and specificity when adjusting for education level and language nuances [26]. These adaptations highlight the need for contextual validation and careful interpretation of scores across populations, especially in multicultural and multilingual settings where direct score comparison may misrepresent cognitive status.

Additionally, subjective cognitive complaints gathered through patient self-reports can signal early cognitive concerns and guide further evaluation [4,7].

3.3.4. Neuroimaging Techniques & Laboratory Testing

Neuroimaging techniques such as MRI and PET scans aid in early detection by revealing structural and functional brain changes. MRI identifies atrophy and vascular changes, while PET scans detect amyloid plaques and tau tangles, supporting differential diagnosis between Alzheimer's and vascular dementia [7]. Exclusion of secondary causes like vitamin deficiency or thyroid disease is possible by blood tests. In atypical cases, CSF analysis detecting amyloid-beta and tau biomarkers supports a more accurate diagnosis [7]. These biomarkers are key to distinguishing MCI due to Alzheimer's disease (AD) from other cognitive disorders and can indicate disease progression [22].

3.3.5. Technological Advancements in Screening

IVA & Verbal Fluency Tests

Intelligent Virtual Agents (IVAs) have shown promise by analyzing conversational patterns. A University of Sheffield study demonstrated how an IVA, using components like speaker diarization and speech recognition, assessed verbal fluency tasks, naming items in a category or starting with a specific letter. Speech features such as turn length, pauses, and vocabulary were analyzed. This system could classify individuals into categories such as healthy, MCI, functional memory disorder (FMD), or neurodegenerative disorder (ND), achieving a classification accuracy of 62% [3].

Mobile Applications & Emerging Blood Biomarkers

ALZ, Cognity, ACE-Mobile, and Cognitive Exams offer multi-domain cognitive assessments. These apps use machine learning and AI to analyze user responses, including clock-drawing tests for risk prediction [4,22]. Additionally, blood-based biomarkers like plasma p-tau and neurofilament light are under investigation as low-cost, scalable tools for routine clinical screening, holding great promise for widespread early detection [4,22].

However, despite growing enthusiasm, the global generalizability of early detection tools remains constrained by major infrastructural, demographic, and cultural limitations. While mobile health solutions, including cognitive assessment apps and AI-based verbal analysis offer scalable opportunities for early dementia detection, their real-world application is constrained by

critical infrastructure and access barriers [27, 28]. In rural and underserved areas, poor broadband coverage, unreliable electricity, and limited device availability pose significant implementation obstacles [27, 28]. Smartphone penetration remains low among older adults in many regions, and even when devices are available, digital literacy is often inadequate [29]. Many elders face challenges navigating app-based interfaces due to cognitive, visual, or physical limitations, and available tools may not be culturally or linguistically tailored [29, 30]. Furthermore, the lack of integration with formal health systems reduces follow-up and limits clinician oversight, raising concerns about standalone diagnoses. Data privacy apprehensions and mistrust of digital interventions may also reduce uptake. To enhance impact, future mHealth solutions should prioritize accessibility, inclusive design, and low-bandwidth functionality [31]. Community-based training, caregiver involvement, and culturally validated adaptations can bridge these gaps and ensure that mobile technologies do not exacerbate existing health inequities.

3.3.6. Challenges in Detection

Early detection of dementia remains difficult due to symptom overlap with normal aging, low public awareness, and stigma, which delay timely intervention. Although lifestyle interventions like exercise and cognitive training can reduce risk, diagnosing MCI is challenging, as its symptoms often mimic typical age-related changes [5,7,22].

Technological screening tools show promise but have limitations. Many apps share overlapping features, lack full DSM-5 cognitive domains such as social cognition, and may not account for cultural or demographic variability, affecting diagnostic accuracy. Biomarkers, while effective, are costly and invasive, making them less accessible in community healthcare. Stigma further discourages individuals from undergoing screening due to fear of labeling and discrimination [4,5].

Cultural and educational differences can affect test validity. For instance, MoCA items may be unsuitable for all backgrounds, increasing misdiagnosis risk. Test-retest reliability studies stress the importance of minimal detectable change (MDC) to differentiate genuine cognitive decline from measurement error [5,6].

Future screening strategies should integrate AI, machine learning, and virtual reality with existing tools. Broader research is needed, especially in mobile tools assessing social cognition. Tools like MoCA-A, validated in Argentina, show how cultural adaptations can enhance early detection of MCI and dementia, leading to more effective, life-improving interventions [4,25].

3.4. Management of Dementia

Dementia management is complex and requires a holistic approach involving both non-pharmacological and pharmacologic strategies to address cognitive, behavioral, and neuropsychiatric symptoms. The primary goal is to enhance the quality of life (QoL) for both patients and their caregivers. As dementia cases are projected to reach between 115 and 131 million worldwide by 2050, effective management strategies are essential to lessen the impact on individuals and society [5,7].

3.4.1. Non-Pharmacologic Interventions

Non-pharmacologic interventions are necessary, as they have minimal side effects and help improve cognitive function, emotional status, and social interaction. They also reduce caregiver strain [7,17,18]. Cognitive stimulation through activities such as reading, puzzles, and memory games has been shown to preserve cognitive function and slow cognitive decline [7]. Regular physical exercise enhances cardiovascular health and cognitive performance in dementia patients [7,18].

Promoting social and emotional well-being is equally important. Community participation, support groups, and structured social interactions can alleviate loneliness and depression [7]. Reminiscence therapy, which involves prompting patients to reflect on and share past experiences, has been shown to enhance mood and support psychological well-being. Creative therapies like music and art foster emotional expression and comfort [17-19]. Multisensory stimulation, particularly useful in later disease stages, can reduce agitation and improve emotional states [20].

Behavioral and psychological symptoms of dementia (BPSD) necessitate targeted and specialized management approaches. Non-pharmacologic methods like reality orientation therapy and behavior management address issues such as wandering, aggression, and incontinence [18]. Sensory-based therapies, including aromatherapy and animal-assisted therapy, have also shown efficacy in reducing anxiety and agitation [18,26].

Caregiver support is a significant part of dementia care. Many caregivers experience high levels of stress, requiring structured training on communication, person-centered care, and coping strategies. Programs offering respite care reduce burnout and help caregivers manage responsibilities while maintaining their own well-being [7,17,20,26].

3.4.2. Pharmacologic Management

While pharmacologic treatments do not cure dementia, they are essential for managing cognitive and behavioral symptoms [7]. Acetylcholinesterase inhibitors (AChEIs), such as donepezil, rivastigmine, and galantamine, enhance cholinergic transmission to support cognition. However, they can cause gastrointestinal side effects and require close monitoring. In moderate to severe dementia, memantine, an NMDA receptor antagonist, may be combined with AChEIs to regulate glutamate activity and provide symptomatic relief [7,19].

Antidepressants, particularly SSRIs like citalopram, are commonly used to manage depression and anxiety, though they must be used cautiously due to risks like hyponatremia, especially in older adults. Antipsychotics may be

prescribed for severe agitation or psychosis but should be limited to short-term use due to the increased risk of cognitive decline and mortality [26].

Benzodiazepines are generally avoided, especially in acute settings, due to risks of sedation, falls, and further cognitive impairment. Emerging drugs like aducanumab (Aduhelm), developed for early-stage Alzheimer's disease, have generated interest but remain controversial due to high cost and uncertain efficacy. In parallel, dietary approaches such as the MIND diet, which combines Mediterranean and DASH diets are being investigated for their potential to prevent or slow cognitive decline [17].

3.4.3. Comprehensive Care and Multidisciplinary Approach

Effective dementia management requires a coordinated medical, psychological, and social care plan [18,21]. It must be tailored to the individual's needs and adjusted over time. Interdisciplinary care teams, including neurologists, social workers, nutritionists, and occupational therapists, are essential for addressing the multifaceted symptoms of dementia [20]. This collaborative model helps optimize care outcomes [18,20].

Specific dementia subtypes may require tailored interventions. For example, in Dementia with Lewy Bodies (DLB) or related types, physiotherapy can address motor symptoms, and dietary adjustments may alleviate swallowing difficulties. Pharmacologic interventions such as zonisamide can improve motor function, while fludrocortisone and midodrine may address autonomic symptoms [21].

Caregivers face substantial emotional, physical, and financial challenges. Support systems must address broader concerns such as driving safety, financial management, and the psychological impact of long-term caregiving. Connecting caregivers with community resources and counseling services is essential to sustaining their role [7,17-20].

As dementia progresses, end-of-life care becomes increasingly important. At this stage, palliative care takes priority, focusing on symptom management, preservation of dignity, and ensuring comfort. Introducing palliative principles early, including pain control, psychological support, and shared decision-making, helps patients and families align care with their values and expectations [18].

3.4.4. The Role of Pharmacogenomics

Enhanced knowledge of pharmacogenomics offers new possibilities for individualized treatment of dementia. By analyzing a patient's genetic makeup, clinicians can design tailored therapeutic strategies aimed at maximizing drug effectiveness while minimizing the risk of adverse reactions. Genetic differences influence drug metabolism, which impacts therapeutic outcomes. Pharmacogenomic testing can guide medication selection and dosing, enhancing treatment precision and safety. As this field evolves, its integration into clinical practice holds promise for optimizing outcomes and improving the quality of life for individuals living with dementia [19].

While numerous evidence-based strategies for dementia prevention and management exist, their successful implementation is often hindered by substantial operational challenges, particularly in low-resource and rural environments [28, 32]. Health systems frequently lack infrastructure to support dementia care at the primary level; this includes inadequate numbers of trained providers, absence of geriatric psychiatry services, and limited access to diagnostic tools such as MRI or cerebrospinal fluid biomarker testing [28]. Pharmacological treatments, though available, may be unaffordable or poorly stocked in public sectors. Non-pharmacologic approaches, such as cognitive stimulation and caregiver training, often require structured delivery models that are rarely funded or implemented outside of academic centers [32]. Furthermore, low health literacy, stigma, and sociocultural resistance to cognitive screening contribute to delayed diagnosis and poor intervention uptake [28, 33]. Caregiver burden is amplified by the near-complete absence of formal respite programs or community-based support services [34]. Finally, most countries still lack national dementia strategies or insurance reimbursement models, further limiting integration into standard care. Overcoming these barriers will require coordinated investment in system-level reforms, community engagement, and policy development that treats dementia as a core component of public health planning.

3.5. Quality of Life

Dementia leads to progressive damage to brain cells, which impacts memory, behavior, and cognition. The condition significantly affects the geriatric population, particularly in later stages, making early intervention and management crucial [7,21]. Memory loss is a hallmark challenge, disrupting speech, mobility, and mood, and often leading to psychosocial difficulties such as agitation, depression, and social withdrawal [10]. Although there is no cure for neurodegenerative or vascular dementia, symptom management through pharmacological and behavioral interventions helps slow disease progression and improve quality of life (QoL) [7]. With advancing age as the primary risk factor, other contributors include hypertension, diabetes, smoking, and depression [9]. A categorized overview of key risk and protective factors contributing to dementia is presented in Figure 2 to highlight the multifactorial nature of the condition.

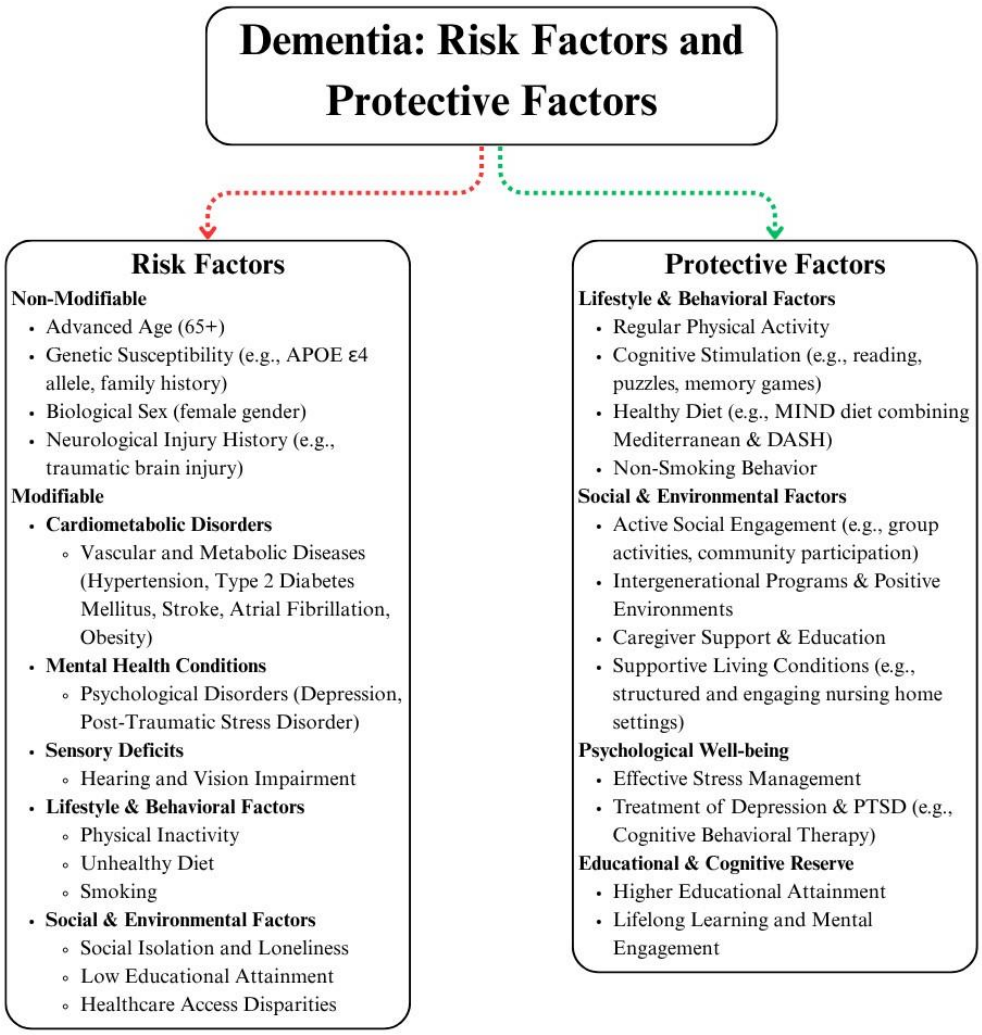

Figure 2. Structured representation of non-modifiable and modifiable risk factors and protective factors associated with dementia in the elderly population

Dementia impacts not just patients, but also families, caregivers, and the healthcare system due to its multifaceted nature [35]. In 2020, the global economic burden of Alzheimer's disease was estimated at $305 billion, and with the continued growth of the elderly population, this figure is projected to approach $1 trillion in the coming years [35]. Loneliness significantly affects cognition and contributes to dementia progression, reducing QoL in elderly patients [36]. Social isolation raises dementia risk by 50% among older people and can also exacerbate symptoms [36, 37]. Additionally, sudden environmental changes, like the COVID-19 pandemic, have exacerbated neuropsychiatric symptoms such as delirium, agitation, and apathy. While the exact cause is unclear, isolation in dementia patients likely played a key role [36, 38]. Depression and anxiety are prevalent in major neurocognitive disorders, particularly Alzheimer's disease [38, 39]. Anxiety rates range from 9.4% in early stages to 39% in advanced cases, while depression ranges from 14.8% to 40% [39]. Up to 80% of dementia patients rely heavily on their families for care, yet one in three caregivers experiences depression due to emotional, financial, and psychosocial strain [40].

As dementia progresses, its burden intensifies for both patients and caregivers [35]. Annual care costs vary, with mild dementia costing approximately $468.28 per capita, while severe cases with formal care raise costs by 67.3%, indicating a clear correlation between disease severity and financial burden [35,41]. Many elderly individuals lack sufficient financial support, making long-term care unaffordable and compromising both QoL and health outcomes [41]. Certain dementia subtypes, such as frontotemporal lobar degeneration or dementia with Lewy bodies, are associated with even greater caregiver strain and resource demands [40]. Promoting social interaction, structured activities, and group engagement significantly improves QoL in patients with dementia [40,42]. Studies in nursing homes have shown that residents exposed to positive environments and frequent family communication experience reduced symptom severity and better overall well-being [42]. In contrast, limited family contact has been associated with worsening symptoms over time [42].

A randomized control study reported that both pharmacologic and non-pharmacologic interventions, such as physical activity and cognitive training improve QoL. Patients experienced better sleep, reduced depression, increased autonomy, and overall improvements in well-being [43].

Beyond cognitive screening and diagnostic precision, social determinants exert a significant influence on the lived experience of dementia, particularly in shaping patient quality of life (QoL) and caregiver burden. While the benefits of social engagement have been broadly acknowledged, their quantification through validated tools remains critical for theoretical rigor and clinical translation. Notably, the WHOQOL-BREF has been widely used in dementia-focused meta-analyses, with recent data showing a moderate positive correlation between social interaction and QoL ($r = 0.31$; 95% CI: 0.12–0.48; $p = 0.0017$). Even stronger effects have been reported for high-quality caregiver relationships ($r = 0.38$; 95% CI: 0.15–0.48; $p = 0.0019$). Additional contributors such as marital status ($r = 0.08$–0.10) and religious participation ($r = 0.35$) also demonstrated measurable improvements in QoL [44].

From the caregivers' perspective, longitudinal cohort studies utilizing the Zarit Burden Interview (ZBI) have highlighted the multifaceted and evolving nature of caregiver burden. Interestingly, reliance on formal care services, whether home-based or community-centered, was associated with greater perceived burden, possibly reflecting the severity of disease and fragmentation of care. ZBI scores increased significantly with home services (estimate = +4.27; $p = 0.002$) and were even higher when both home and community services were used (estimate = +8.00; $p = 0.009$). Conversely, cohabitation with children was associated with a reduction in caregiver burden (estimate = –3.24; $p = 0.042$) [34]. These findings emphasize that, although formal support systems are essential, the nature and quality of social relationships play a decisive role in shaping both patient outcomes and caregiver resilience. Future investigations should integrate validated measures, such as the WHOQOL-BREF and ZBI, to allow for more nuanced analysis and to guide the development of culturally sensitive, targeted interventions.

4. Conclusions

Dementia is an emerging global health challenge that demands a complete response to prevention, early detection, and care. Addressing modifiable risk factors, such as hypertension, diabetes, and social isolation, alongside non-modifiable factors like age and genetics, is essential. Studies like the Framingham Heart Study emphasize the importance of midlife cardiovascular health, highlighting the need for early intervention. Yet, applying the findings to public health policy is still challenging, particularly in low-resource environments with compromised healthcare infrastructure.

Artificial intelligence (AI) holds new promise for the identification of early dementia. Research such as the University of Sheffield's IVA study demonstrates how AI-based conversational analysis can detect mild cognitive impairment (MCI). Mobile applications like Cognity also provide scalable assessment tools. However, barriers such as cultural adaptability and digital connectivity remain, most prominently among underprivileged groups. Ensuring that AI models are inclusive and culturally sensitive is critical for broader implementation.

Management strategies combining pharmacologic and non-pharmacologic approaches have proven effective. Acetylcholinesterase inhibitors alleviate symptoms, while interventions like cognitive training and physical activity improve quality of life. Evidence from randomized controlled trials in long-term care settings shows tailored activities reduce depression and enhance autonomy. Yet, the caregiver's role requires more emphasis, as caregivers often face significant emotional, physical, and financial burdens. Expanding access to caregiver support programs is crucial for improving the well-being of both patients and their families.

Early detection on a population scale remains challenging because truly affordable and minimally invasive diagnostic options are lacking. Although biomarkers derived from cerebrospinal fluid and neuroimaging techniques provide valuable diagnostic information, their high cost and procedural demands limit their feasibility for widespread use. Blood-based biomarkers offer a more accessible, lower-cost alternative for early diagnosis across broader populations, including those in low-income settings.

Community-based initiatives that promote social interaction, such as intergenerational engagement programs, also serve as valuable dementia prevention tools. Programs in the UK and Scandinavia demonstrate how enhancing social connections can reduce risk factors, improve mental health, and boost well-being, offering a proactive, cost-effective model for care.

Despite promising developments in diagnostic and management tools, real-world implementation of dementia interventions remains uneven, particularly in low-resource or aging societies. Challenges span across individual, community, and systemic domains. At the individual level, cognitive health awareness remains limited, and digital illiteracy hampers uptake of mHealth screening platforms. At the community level, caregiving burdens often fall on untrained family members, with minimal respite support or psychosocial training. Systemically, fragmented health infrastructure, high costs of long-term care, and limited national dementia policies compound these barriers. Cultural stigma and ageism further restrict help-seeking behavior. To ensure equitable impact, dementia care models must shift toward community-embedded, stakeholder-informed interventions that leverage both formal systems and existing social capital. Tailored approaches, sensitive to local needs and structural realities,

are essential to bridge the gap between innovation and impact.

In conclusion, reducing the impact of dementia requires an integrated, holistic approach blending technology, accessible diagnostics, caregiver support, and socially driven prevention. Advancing in these areas will help ensure that individuals affected by dementia experience greater dignity, autonomy, and quality of life. Future frameworks must integrate these contextual limitations, especially infrastructural, cultural, and digital divides, to enhance the global generalizability of dementia screening strategies.

Competing Interests

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

Not applicable.

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