



International Journal of Medical and All Body Health Research

Is Covid-19 severe in patients with Alzheimer's disease?

Mohaddeseh Mirzaei

MSc in Geriatric Nursing, University of Social Welfare and Rehabilitation Sciences (USWR), Tehran, Iran

* Corresponding Author: **Mohaddeseh Mirzaei**

Article Info

ISSN (online): 2582-8940

Volume: 04

Issue: 02

April-June 2023

Received: 22-05-2023;

Accepted: 10-06-2023

Page No: 53-56

Abstract

Alzheimer's disease (AD), as a degenerative neurodegenerative disease that has a growing trend causes the exacerbation of the infectious disease of COVID-19, or on the contrary, the infection of Covid-19 can aggravate the symptoms of AD and the severe form of COVID-19 appears. There are several mechanisms for the worsening of AD condition after COVID-19. It is reasonable to assume that COVID-19 has a more severe impact on patients with comorbidities, including those with AD. As such, individuals with AD should take additional preventive measures to avoid contracting COVID-19, as they are at a heightened risk of developing severe symptoms of the disease, which could result in increased mortality rates.

Keywords: Alzheimer's disease, COVID-19, SARS-CoV-2, Infection

Introduction

Alzheimer's disease (AD) is a neurodegenerative condition that gradually affects the brain, resulting in cognitive impairment, memory loss, and alterations in behavior ^[1]. While the exact cause of AD is not completely clear, it is thought to result from a combination of genetic, environmental, and lifestyle factors. A key feature of the disease is the buildup of atypical proteins in the brain, such as beta-amyloid plaques and tau protein tangles, which can obstruct normal brain cell activity and lead to neuron degeneration and death overtime ^[2]. The symptoms of AD generally begin with mild memory impairment and challenges in acquiring and retaining new information. As the illness advances, symptoms can intensify, causing issues with language, decision-making, and judgment. In the later stages, individuals with AD may encounter difficulties with fundamental daily activities, such as self-care, such as eating, grooming, and dressing ^[3, 4]. Alzheimer's disease is a pressing global health concern, with approximately 55 million individuals worldwide currently afflicted by the condition ^[5]. As the population ages, the incidence of AD is expected to rise, underscoring the importance of ongoing research efforts aimed at elucidating the disease's causes and developing more efficacious treatments ^[6, 7]. SARS-CoV-2, the virus responsible for COVID-19, can attack all organs even the nervous system and cause neurological symptoms in patients ^[8-12]. There is concern that this may lead to long-term neuronal damage and the development of neurodegenerative diseases such as AD. There appears to be a reciprocal relationship between AD and COVID-19, with patients with AD possibly being more susceptible to severe COVID-19, and COVID-19 patients being more likely to develop AD ^[8]. There is a hypothesis that SARS-CoV-2 could result in CNS damage either through direct neurotoxicity or indirectly by triggering the host immune response, which may lead to demyelination, neurodegeneration and cellular senescence. Consequently, it could accelerate brain aging and increase the risk of developing neurodegenerative conditions such as dementia ^[9]. Due to factors such as advanced age, the presence of multiple medical conditions, and challenges in adhering to physical distancing guidelines, individuals with dementia are at heightened risk of contracting COVID-19 ^[10]. Individuals with AD may be significantly affected by COVID-19 infection. This is because the infection can worsen cognitive decline and memory loss in patients with AD, which can result in heightened functional impairment and reduced quality of life ^[11].

SARS-CoV-2 may exacerbate AD symptoms by directly entering the central nervous system and damaging critical memory storage areas, or as a consequence of chronic hypoxia, oxidative stress, or increased production of peripheral pro-inflammatory cytokines^[12]. AD may develop after SARS-CoV-2 infection due to various mechanisms, such as mitochondrial dysfunction and heightened oxidative stress, both of which contribute significantly to the pathophysiology of AD. One of the effects of oxidative stress is the reduction of α -Secretase activity, which leads to an increase in beta-amyloid production^[12]. The induction of a cytokine storm by the coronavirus can have unforeseeable ramifications in the nervous system. One important concern is how this process may influence the onset and progression of neurodegenerative disorders like Alzheimer's and Parkinson's disease. The coronavirus has the potential to trigger microglial activation, leading to the production of inflammatory cytokines, prostaglandin E2, nitric oxide, and free radicals, ultimately resulting in chronic neuroinflammation and cell death^[13]. Bianchetti *et al.* revealed a significantly higher mortality rate of 62.2% among COVID-19 patients with dementia compared to 26.2% in those without dementia. Individuals with dementia were found to be at a 1.84 times higher risk of dying from COVID-19 compared to those who did not have dementia. Among those with dementia, the most common initial symptoms were delirium and a decline in functional status^[11]. However, within nursing homes in the United States, out of 10,576 confirmed COVID-19 cases, individuals with dementia comprised 52% of the cases, but accounted for 72% of all COVID-19 related deaths, indicating a 1.7 times higher risk of mortality compared to those without dementia^[14]. Generally, the most vulnerable to COVID-19 encompasses older adults and individuals with pre-existing medical conditions. Those who reside in long-term care facilities are typically elderly and afflicted with multiple comorbidities, making them particularly susceptible to the virus^[15]. So, it is reasonable to assume that COVID-19 has a more severe impact on patients with comorbidities, including those with AD. As such, individuals with AD should take additional preventive measures to avoid contracting COVID-19, as they are at a heightened risk of developing severe symptoms of the disease, which could result in increased mortality rates.

References

- Mehta RI, Schneider JA. What is 'Alzheimer's disease'? The neuropathological heterogeneity of clinically defined Alzheimer's dementia. *Current opinion in neurology*. 2021; 34(2):237-45.
- Armstrong RA. What causes Alzheimer's disease?. *Folia Neuropathologica*. 2013; 51(3):169-88.
- Lyketsos CG, Carrillo MC, Ryan JM, Khachaturian AS, Trzepacz P, Amatniek J, Cedarbaum J, Brashear R, Miller DS. Neuropsychiatric symptoms in Alzheimer's disease. *Alzheimer's & Dementia*. 2011; 7(5):532-9.
- Rosenberg PB, Nowrangi MA, Lyketsos CG. Neuropsychiatric symptoms in Alzheimer's disease: What might be associated brain circuits?. *Molecular aspects of medicine*. 2015; 43:25-37.
- Li X, Feng X, Sun X, Hou N, Han F, Liu Y. Global, regional, and national burden of Alzheimer's disease and other dementias, 1990–2019. *Frontiers in Aging Neuroscience*. 2022; 14:937486.
- Zhang E. Alzheimer's Disease: Why is Early Detection Important?. *Journal of Student Research*, 2023, 12(2).
- Zeisel J. Environmental design effects on Alzheimer symptoms in long-term care residences. *World hospitals and health services: the official journal of the International Hospital Federation*. 2000; 36(3):27-31.
- Tabatabaai SA, Soltani P, Khanbabaee G, Sharma D, Valizadeh R, Farahbakhsh N, Tariverdi M, Pourghasem M, Tabiei E. SARS Coronavirus 2, severe acute respiratory syndrome, and middle east respiratory syndrome in children: A review on epidemiology, clinical presentation, and diagnosis. *Archives of Pediatric Infectious Diseases*. 2020; 8(4):1-8.
- Mirshamsi M, Ghiasi N, Heidari S, Hosseinpour P, Hassanlouei B, Hashemipour SM, Aidenloo NS, Valizadeh R. Conjunctivitis and other ocular manifestation following Covid-19; updated information about transmission of Covid-19 by eye. *Immunopathologia Persa*. 2021; 7(2):e28.
- Dadashzadeh N, Farshid S, Valizadeh R, Nanbakhsh M, Rahimi MM. Acute respiratory distress syndrome in COVID-19. *Immunopathologia Persa*. 2020; 6(2):e16.
- Besharat S, Alamda NM, Dadashzadeh N, Talaie R, Mousavi SS, Barzegar A, Tavana S, Valizadeh R, Frouzesh M. Clinical and demographic characteristics of patients with COVID-19 who died in Modarres hospital. *Open Access Macedonian Journal of Medical Sciences*. 2020; 8(T1):144-9.
- Mohamad Rahimi M, Jahantabi E, Lotfi B, Forouzesh M, Valizadeh R, Farshid S. Renal and liver injury following the treatment of COVID-19 by remdesivir. *Journal of Nephropathology*. 2021; 10(2):1-4.
- Ciaccio M, Lo Sasso B, Scazzone C, Gambino CM, Ciaccio AM, Bivona G, Piccoli T, Giglio RV, Agnello L. COVID-19 and Alzheimer's disease. *Brain sciences*. 2021; 11(3):305.
- de Erausquin GA, Snyder H, Carrillo M, Hosseini AA, Brugha TS, Seshadri S, CNS SARS-CoV-2 Consortium. The chronic neuropsychiatric sequelae of COVID-19: The need for a prospective study of viral impact on brain functioning. *Alzheimer's & Dementia*. 2021; 17(6):1056-65.
- Livingston G, Huntley J, Sommerlad A, Ames D, Ballard C, Banerjee S, Brayne C, Burns A, Cohen-Mansfield J, Cooper C, Costafreda SG. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *The Lancet*. 2020; 396(10248):413-46.
- Bianchetti A, Rozzini R, Guerini F, Boffelli S, Ranieri P, Minelli G, Bianchetti L, Trabucchi M. Clinical presentation of COVID19 in dementia patients. *The journal of nutrition, health & aging*. 2020; 24:560-2.
- Mohammadkhanizadeh A, Karimzadeh F. COVID-19 and Alzheimer's Disease: A Review of Mechanisms and Pathophysiology. *Shefaye Khatam* 2021; 9(2):151-159.
- Smith JA, Das A, Ray SK, Banik NL. Role of pro-inflammatory cytokines released from microglia in neurodegenerative diseases. *Brain research bulletin*. 2012; 87(1): 10-20.
- CarePort Health. Covid-19 report. <https://careporthealth.com/wp-content/uploads/2020/05/COVID-19-Report-3.pdf>. Date accessed: July 10, 2020.
- D'Adamo H, Yoshikawa T, Ouslander JG. Coronavirus disease 2019 in geriatrics and long-term care: the

ABCs of Covid-19. Journal of the American Geriatrics Society. 2020; 68(5):912-7.