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# Exposure to Aluminum in Drinking Water and the Risk of Developing Alzheimer's Disease: A Bibliometric Analysis and Systematic Evaluation

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**Abstract:** The consumption of drinking water containing aluminum levels that exceed regulatory limits (e.g., the WHO's guideline value of 0.1–0.2 mg/L) may be associated with the potential risk of developing Alzheimer's disease. However, according to the analyses conducted, it was observed that the scientific evidence on this topic is still limited and contradictory within the scientific community. A bibliometric analysis of 390 articles published between 1979 and 2023 and a systematic review of 20 original articles found that interest in this topic has been decreasing in recent years. The most recent studies focus on the relationship between aluminum and Alzheimer's disease, suggesting that exposure to high levels of aluminum in drinking water may increase the risk of developing this disease and other neurodegenerative disorders. Nevertheless, other studies have concluded that there is no clear causal relationship between aluminum and Alzheimer's disease. These studies suggest that other factors, such as age, genetics, or exposure to other toxins, may play a more significant role in the development of this condition. More comprehensive studies with improved methodological quality are needed to better understand the relationship between aluminum and Alzheimer's disease and to establish a definitive conclusion on this subject. Of the 20 articles systematically reviewed, 12 (60%) reported a positive association between aluminum exposure in drinking water and increased risk of Alzheimer's disease, while 8 (40%) found no significant association. Five studies (25%) were large-scale epidemiological investigations with robust methodologies. However, the current evidence remains insufficient to establish a definitive causal relationship, highlighting the need for more conclusive research in this area

**Keywords:** drinking water; neurodegenerative diseases; metals; health; humans



**Citation:** Cutipa-Díaz, Y.M.; Huanacuni-Lupaca, C.; Limache-Sandoval, E.M.; Mamani-Huanca, D.Y.; Sánchez-Esquiche, W.M.; Rubira-Otarola, D.G.; Gutiérrez-Cueva, R.N.; Sacari Sacari, E.J. Exposure to Aluminum in Drinking Water and the Risk of Developing Alzheimer's Disease: A Bibliometric Analysis and Systematic Evaluation. *Water* **2024**, *16*, 2386. https://doi.org/10.3390/w16172386

Academic Editor: Argaw Ambelu

Received: 21 July 2024
Revised: 21 August 2024
Accepted: 22 August 2024
Published: 25 August 2024



## 1. Introduction

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that gradually develops and involves the deterioration and degeneration of brain functions. It is one of the most common causes of dementia, accounting for approximately 60–70% of cases of progressive cognitive decline in older individuals [1]. AD is characterized by a slow onset and a continuous decline in cognitive abilities, including memory, language, problem solving, and other mental skills that affect a person's ability to perform everyday activities [2]. The disease typically begins after age 65, and the risk increases with age. It is estimated that by 2050, the number of people aged 65 and older with Alzheimer's dementia may grow