

## Fluoride detox in early life as an initiative to eliminate Alzheimer's disease causing agents in Pakistan.

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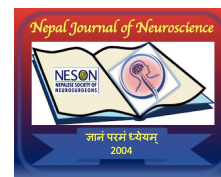
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### Abstract

This investigation examines the association between fluorosis and Alzheimer's disease in the Pakistani population. Our findings suggest that elevated fluoride exposure leads to disrupted glutamate homeostasis, thereby increasing the likelihood of developing Alzheimer's disease. Globally, the prevalence of Alzheimer's disease exceeded 50 million cases in 2018, and Pakistan's sizable youth population is projected to be at heightened risk of dementia and Alzheimer's disease by 2050. The excessive consumption of fluoride in Pakistan is attributable to the widespread use of fluoridated toothpastes, groundwater with elevated fluoride concentrations, tea, coffee, and cookware. To counteract this risk, we propose the implementation of fluoride-removing water filtration systems, the use of fluoride-free toothpastes, support for non-fluoridated agricultural practices, and the promotion of awareness programs aimed at reducing fluoride exposure and preventing Alzheimer's disease.

### Dear Editor,

Fluoride is a mineral that is often consumed excessively in Pakistan from a very long time and it is found to have a strong link to Alzheimer's disease<sup>1</sup>. Uncontrolled fluoride exposure increases Glutamic Acid Decarboxylase (GAD) activity in the hippocampus, significantly reducing Glutamate levels. Excess fluoride also inhibits the activity of enzymes Aspartate Aminotransferase (AST) and Alanine Aminotransferase (ALT) which are necessary for glutamate synthesis. Altered levels of Glutamate impair memory and learning thus, leading to Alzheimer's disease. Alzheimer's disease being an irreversible condition must be prevented by reducing fluorosis in early stage of life<sup>2</sup>. The global prevalence of Alzheimer's is expected to rise from 47 million in 2015 to 131 million by 2050, with low- and middle-income countries (LMICs) bearing the majority of the burden. By 2030, the number of people living with dementia is expected to reach 75 million, posing significant social and economic challenges, particularly in LMICs<sup>3</sup>.

Sources of fluoride detox: 1) Excess usage of toothpaste and mouthwashes in children due to unawareness. 2) Fluoridated water 3) Tea and coffee, avoiding early exposure in children 4) Teflon cookware: usage of such things due to its nonstick nature has increased. But, at high temperatures, it releases fluoride and other toxic fumes. 5) Cryolite: a pesticide used on potatoes and cabbages. Ingestion of a few hundred grams causes fluoride poisoning<sup>4</sup>.

Fluorine is naturally present in small amounts in our bodies and environment. However, excessive levels can be harmful, causing fluorosis, according to the National Institute of Health (NIH). Despite the risks, many consume tap water and bottled groundwater with high fluoride levels, unaware of the dangers. Alarmingly, mothers may also use fluoridated water to mix infant milk powders, potentially affecting their babies<sup>5</sup>. There are several steps to minimize fluoride exposure hence reducing the risk of Alzheimer's (Table:01) using water with optimal fluoride levels, as recommended by the World Health Organization (WHO), and for governments to regulate bottled water contents to ensure public safety. 2) Switching to fluoride-free toothpaste and limiting processed foods. 3) Supporting non-fluoridated agriculture. 4) Pharmaceutical companies should reduce fluoride levels in their products. 5) awareness programs for the public on the potential link between fluorosis and Alzheimer's disease.

*Table 01: Different aspects of decreasing usage of fluoride in Pakistan.*

Aspect	Details
Prevalence of Fluoride Exposure	High fluoride levels in drinking water, affect over 50% of the population in certain areas.
Potential Link to Alzheimer's Disease	Recent studies suggest a possible link between high fluoride exposure and cognitive decline.

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Detox Methods	- Use of fluoride filters in drinking water. Dietary interventions (e.g., increased calcium and magnesium intake). Early-life interventions in schools.
Implementation in Pakistan	Pilot programs in regions with high fluoride exposure (e.g., Thar Desert).
Expected Benefits	- Reduction in fluoride levels in the population.- Potential decrease in Alzheimer's disease incidence. Improved overall cognitive health.
Supporting Data	A study by Bashash et al. (2017) found a correlation between prenatal fluoride exposure and lower IQ in children, suggesting potential long-term cognitive effects.

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