A 19-year-old is the youngest person to be diagnosed with Alzheimer's disease—the cause is a mystery

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Credit: AI-generated image (disclaimer)

A 19-year-old man from China, who has been having memory problems since the age of 17, was diagnosed with dementia, according to a recent case study published in the *Journal of Alzheimer's Disease*.

After conducting a barrage of tests, researchers at the Capital Medical University in Beijing diagnosed the teenager with "probable" Alzheimer's disease. If the diagnosis is correct, he will be the youngest person ever to be recorded with the mind-robbing disease.

The main risk factor for the disease is getting old, which makes this latest case so unusual.

The exact causes of Alzheimer's are still largely unknown, but a classical feature of the disease is the build-up of two proteins in the brain: beta-amyloid and tau. In people with Alzheimer's, beta-amyloid is usually found in large quantities outside of neurons (brain cells), and tau "tangles" are found inside axons, the long, slender projection of neurons.

However, scans failed to show any signs of these features in the 19-year-old's brain. But the researchers did find abnormally high levels of a protein called p-tau181 in the patient's cerebrospinal fluid. This typically happens before the formation of tau tangles in the brain.

Nearly all cases of Alzheimer's disease in people younger than 30 are due to inherited faulty genes. Indeed, the previous youngest case—a 21-year-old—had a genetic cause.

Three genes have been linked to Alzheimer's disease in the young: amyloid precursor protein (APP), presenilin 1 (PSEN1) and presenilin 2 (PSEN2).

These genes are involved in producing a protein fragment called beta-amyloid peptide, a precursor to the previously mentioned beta-amyloid. If the gene is faulty, it can lead to an abnormal build-up (plaques) of beta-amyloid in the brain—a hallmark of Alzheimer's disease and a target for treatments such as the recently approved drug lecanemab.

People only need one of APP, PSEN1 or PSEN2 to be faulty to develop Alzheimer's disease, and their children have a 50:50 chance of inheriting the gene from them and developing the disease, too.

However, a genetic cause was ruled out in this latest case as the researchers performed a whole-genome sequence of the patient and failed to find any known genetic mutations. And nobody in the teenager's family has a history of Alzheimer's disease or dementia.

The young man also had no other diseases, infections or head trauma that might explain his condition. It is clear that whatever form of Alzheimer's he has, it is extremely rare.

Severely impaired memory

At the age of 17, the patient started having problems concentrating on his school studies. This was followed a year later by the loss of his short-term memory. He couldn't recall if he'd eaten or done his homework. His memory loss became so severe that he had to drop out of high school (he was in his final year).

A probable diagnosis of Alzheimer's disease was confirmed by standard cognitive tests used to detect memory loss. The results suggested his memory was severely impaired. The brain scans also showed that his hippocampus—a part of the brain involved in memory—had shrunk. This is a typical early sign of dementia.

A brain biopsy would be too risky, so understanding the biological mechanisms of his dementia is difficult—and this case remains a medical mystery at this point.

Cases of early-onset Alzheimer's disease are on the rise in younger patients. Sadly, this is unlikely to be the last such rare case that we hear

about.

More information: Jianping Jia et al, A 19-Year-Old Adolescent with Probable Alzheimer's Disease, *Journal of Alzheimer's Disease* (2022). DOI: 10.3233/JAD-221065

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