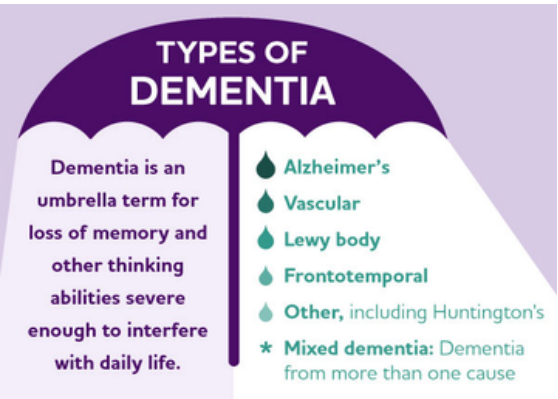


What is Dementia?

Dementia is a group of symptoms that have a negative impact on a person's memory, thinking processes, and social abilities to the point that they make it difficult for them to function normally in day-to-day life. Dementia is not a sickness in and of itself but rather a symptom that may be caused by a variety of different diseases. Memory impairment is a typical sign of dementia, but there are other conditions that may cause forgetfulness. Memory loss is a frequent sign of dementia, but unfortunately, it is not adequate diagnostic criteria on its own (Zucchella et al., 2018).



Types and Stages of Dementia

Alzheimer's disease: It is the most common reason people end up with dementia. Researchers have found three genes where mutations may result in the sickness being carried from parent to child. The precise origins of Alzheimer's disease are still unclear; however, researchers have identified three genes where mutations may result in the illness. The apolipoprotein E4 gene is linked to a considerable increase in the risk of Alzheimer's disease, while it is probable that other genes also have a role (APOE). Alzheimer's disease is characterised by the presence of plaques and tangles. In Alzheimer's disease, the beta-amyloid protein may clump together to create plaques, while the tau protein can form tangles that are fibrous and intractable. It is believed that these aggregates pose a threat to healthy neurons as well as the axons that link them (McWilliams et al., 2018).

Vascular dementia: This particular kind of dementia is brought on by disruptions in the normal flow of blood to the brain. Strokes and other neurological difficulties, such as the death of white matter axons, may be caused by problems with blood flow, which can also contribute to these conditions (Ong et al., 2018). The inability to find solutions to issues, a slowdown in mental processing speed, and a worsening of organisational abilities are all symptoms of vascular dementia. In most cases, the onset of these symptoms occurs before memory loss happens.

Lewy body dementia: The abnormal protein aggregates known as Lewy bodies are present in patients with dementia with Lewy bodies, Alzheimer's disease, and Parkinson's disease. This is a characteristic shared by all three diseases. This kind of dementia is one of the many types of progressive dementia, and it is one of the more common ones. Problems concentrating, acting out in one's sleep, and seeing things that are not there are frequent symptoms. A number of additional symptoms include unsteadiness, tremors, and stiffness (parkinsonism) (Capouch et al., 2018).

Frontotemporal dementia: Degeneration of the frontal and temporal lobes is a characteristic feature of this group of illnesses. These are the kind of things that include characteristics of human nature, acts, and speech. The indications and symptoms that are seen most often include challenges with one's behaviour, character, cognitive abilities, judgement, communication, and motor skills.

Mixed dementia: According to tests of their brains that were done during autopsy, dementia in persons aged 80 and above is generally the consequence of many causes, including Alzheimer's disease, vascular dementia, and Lewy body dementia. This was determined by examining the brains of deceased individuals. Research is currently being done to determine how mixed dementia affects symptoms as well as treatment options (Moreno-Morales et al., 2020).

Potential Treatment and Technology for Dementia

Patients with Alzheimer's disease and their caregivers may be able to spend more quality time together if some of the negative symptoms of the disease can be alleviated. In addition, patients may be able to keep their feeling of self-worth and independence for a longer period of time. Cholinesterase inhibitors, such as galantamine, rivastigmine, or donepezil, may be beneficial for Alzheimer's patients with mild to moderate symptoms. These medications could help reduce or control some of the cognitive and behavioural issues that patients experience (Ismail et al., 2020).

In patients with Alzheimer's disease, the use of cholinesterase inhibitors has been demonstrated to reduce the breakdown of acetylcholine, a neurotransmitter in the brain that has been related to improvements in memory as well as cognitive performance. However, since Alzheimer's disease is associated with a decrease in the generation of acetylcholine in the brain, it is probable that the effectiveness of these medications may diminish over time as the illness progresses. It is conceivable that a person with Alzheimer's disease would respond differently to one medication than they would to another treatment; however, since cholinesterase inhibitors all operate in a similar manner, switching from one to the other is unlikely to have significantly different results (Ning et al., 2020).

Medications and therapies are considered to be illness-modifying when they focus on treating the patient rather than the disease itself. At this time, aducanumab is the only disease-modifying medication for Alzheimer's disease that has been authorised by the FDA (Alzobaidi et al., 2021). This treatment is an immunotherapy that employs the use of a human antibody to reduce the number of amyloid plaques in the brain that are associated with Alzheimer's disease. The only people who participated in clinical trials of aducanumab were those who had mild to moderate cognitive impairment or who were in the early stages of Alzheimer's disease. Researchers are currently investigating the possibility that this medication might reduce the natural decline in a person's cognitive ability that comes with advancing age (Cerami et al., 2022).

In order for medical professionals to be able to administer aducanumab, it is necessary for them to first determine whether or not amyloid plaques are present in the brain via the use of diagnostic procedures such as PET scans or examinations of cerebrospinal fluid. The diagnosis of Alzheimer's disease, which is required before a patient can be given medication, might be facilitated with the use of this. It is possible that individuals who are taking aducanumab may need to have routine magnetic resonance imaging scans (MRIs) in order to screen for significant side effects, such as brain edema or haemorrhage (Folch et al., 2018).

The University of Strathclyde, in conjunction with other academic establishments, is doing research to develop an artificial intelligence (AI) companion for the purpose of assisting people who have dementia. People who suffer from dementia, such as Alzheimer's disease, will reap the benefits of the technology since it will make it easier for them to recollect memories, it will boost their confidence, and it will fight depression. Patients with Alzheimer's disease lose their capacity to recall recent events first, followed by their ability to remember things from the distant past. AMPER (Agent-based Memory Prosthesis to Encourage Reminiscing) is a new project that will take an AI-driven, user-centred approach and focus on personalised storytelling in order to help bring a patient's memories back to the surface. This is in contrast to the physical aids and repetitive reminding techniques that are utilised in traditional forms of rehabilitative care (Tisher and Salardini, 2019).

The key institutions that are responsible for leading the research are Heriot-Watt University and the National Robotarium, which is a partnership between HWU and the University of Edinburgh. The Engineering and Physical Sciences Research Council (EPSRC), which is a member of the UK Research and Innovation organisation, awarded the University of Strathclyde a grant in the amount of £390,000. This money funded the university's research (UKRI). In order to be able to deliver individualised recall, emerging technologies will need to include the principles of cognitive science and computer science. The currently available technology is unable to provide individualised medical attention to each patient. AMPER and other artificial intelligence agents with memories similar to those of humans will aid caregivers in recognising the changing needs of dementia patients and providing the right support (Shi et al., 2021).

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