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Essay Title: **Alzheimer's Disease**

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### • **What is Dementia?**

Dementia represents a group of disorders affecting the brain's ability to think, manage behavioural responses and perform everyday tasks. Among various types of dementia, Alzheimer's Disease (AD), counts for 50 to 70% of all dementia types. AD causes problems with thinking, memory and behaviour.

### • **Alzheimer's Disease and ageing**

While AD is not a normal part of aging, it is believed that age is the single highest risk factor for AD development, in fact doubling every five years after the age of 65. However a small percent (~5) of all AD cases occur in younger people in their 40s or 50s. This type is also known as early onset AD and is mainly due to genetic reasons.

### • **Early signs of Alzheimer's Disease**

It may be difficult to know the difference between typical age and AD related changes. Majority of AD patients have similar symptoms and being able to detect these changes could make the difference of early diagnosis vs. going un-detected for many years with complicated consequences. Early diagnosis will give the patient a chance to seek treatment and plan for his/her future. Some of the common early signs of AD are, (1) Memory impairment affecting daily life, (2) Unable to perform everyday tasks, (3) Misunderstanding of time and/or place, (4) Confusion with language and verbal communication, and (5) Misplacing items.

### • **Clinical Diagnosis**

Clinical diagnosis of AD includes a series of Neuropsychology and brain imaging tests. Neuropsychological testing is used to learn more about the nature and level of a person's impairment. The testing is often conducted by psychology specialist familiar in the relationship between the brain and behavioural responses. Several tests are available that can narrow the range of possible diagnoses by producing test patterns that resemble Alzheimer's or other conditions. Brain imaging tests include Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) scans which are used to test the anatomical and cognitive status of the brain.

### • **Preventing the progression of Alzheimer's Disease**

Whether risk of developing dementia and specifically AD could be delayed or prevented and/or the progression could be minimized is an on-going debate among researchers in the field. However a good heart health, physical exercise and diet are some of the common factors that have shown to have impact on lowering the risk of AD and its progression. Cardiovascular diseases such as high blood pressure, heart disease, stroke, diabetes and high cholesterol are likely to increase the risk of developing AD. A healthy

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diet and exercise may directly benefit brain cells by increasing blood and oxygen flow. Regular exercise has direct benefits for the heart and a healthy heart will protect brain health.

### • **Latest research into treatment and diagnosis of Alzheimer's Disease**

Currently, there is no cure for AD and most treatments are focused on minimizing the cognitive effects. Some of the most recent research findings related to AD are as follows:

#### **1. Stroke-like symptoms predicts memory problems**

A recent study<sup>1</sup> on more than 23000 subjects in USA has shown a positive correlation between early symptoms of stroke and incident of cognitive impairment. Recruited subjects had an average age of 64 with no cognitive problems. They all completed a questionnaire on stroke symptoms. Neuropsychology tests were also performed to rank each patients memory and thinking skills. Out of all subjects, 7223 people had responded positively to stroke-like symptoms. Caucasians who had stroke symptoms were twice as likely to develop cognitive problems (11%) compared to those who did not have stroke symptoms (5%). African-Americans who had stroke symptoms were nearly 70 % as likely to develop cognitive problems compared to African-Americans who did not have stroke symptoms (10%).

#### **2. Retinal Changes are linked to early on-set of Alzheimer's Disease**

Recent studies show a number of similarities between AD pathology and the eye retinal changes. Functional and structural changes of the retina have been described in AD, which interestingly, is observed in glaucoma, *the second major cause of blindness*. There are number of striking similarities among the two disorders. The prevalence of both increases with age, both involve neurodegenerative processes and there are vascular changes recognised in both conditions. A 26% prevalence of glaucoma has been reported in AD patients, compared to 5% in healthy subjects<sup>2</sup>. The unique connection between the eye and the brain, makes the retina an excellent target area to study early retinal changes associated with pre-clinical AD. Curcumin, from the Indian spice turmeric, has recently been investigated for its ability to bind to beta-amyloid plaques, one of the hallmark features of AD. In addition to its propensity to bind to plaques, Curcumin has an optical fluorescence property that makes it a potential imaging marker for AD pathology in the retina. Recent studies suggest that imaging the retina in AD patients may reveal early symptoms of the disease.

#### **3. Cardiovascular disease and Alzheimer's Disease**

Evidence is emerging from recent studies linking changes in large artery function to cognitive impairment. The elastic properties of the arteries allow a pressure wave to travel along it. Propagation of this pulse wave is associated with the stiffness of the arteries, such that higher speeds of pulse wave propagation (*PWV; Pulse Wave Velocity*) are associated with less-stiff arteries. PWV is a non-invasive, robust and reproducible indicator of arterial stiffness. Different studies have investigated the association between PWV and cognitive function<sup>3,4</sup>. A recent study<sup>5</sup> on 1433 patients has shown higher large artery stiffness was associated with worse cognitive function. However, longitudinal studies are needed to confirm these associations.

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## **References:**

1. Kelley, B. J. *et al.* Report of stroke-like symptoms predicts incident cognitive impairment in a stroke-free cohort. *Neurology* WNL.0b013e31829a352e– (2013).doi:10.1212/WNL.0b013e31829a352e
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3. Benetos, A. *et al.* Pulse wave velocity is associated with 1-year cognitive decline in the elderly older than 80 years: the PARTAGE study. *Journal of the American Medical Directors Association* **13**, 239–43 (2012).
4. Scuteri, A. *et al.* Arterial stiffness as an independent predictor of longitudinal changes in cognitive function in the older individual. *Journal of hypertension* **25**, 1035–40 (2007).
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- Name of Disorder
- Content (approximately 1,000 words, pictures may be included)
- References