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## Review Article

# Alzheimer's disease: Potential preventive, non-invasive, intervention strategies in lowering the risk of cognitive decline – A review study

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## ABSTRACT

The number of elderly people nowadays is rapidly increasing, especially in the developed countries. This brings about serious problems such as occurrence of diseases connected with aging population. The most frequent aging disease seems to be Alzheimer's disease (AD). The purpose of this article is to briefly describe the individual phases of this disease with special focus on the preclinical stage of AD since in this phase people might be already affected by some brain changes but they are still mentally and physically healthy individuals. Thus, the main goal of this article is to explore the preventive, non-invasive, intervention strategies which can help people already in the preclinical period of AD to lower the risk of cognitive decline and in this way enable them to stay independent on the assistance of other people and constantly attempt to improve quality of their life even in the older age. Firstly, a method of literature review analyzing the data contained in the world's prestigious scientific database: Web of Science in the period of 1990–2014 is used. Secondly, a method of comparison of different research studies examining preventive, non-invasive, intervention strategies in lowering the risk of cognitive decline is applied.

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## Introduction

The number of elderly people nowadays is rapidly increasing, especially in the developed countries. According to the Eurostat agency, the number of aging population will double

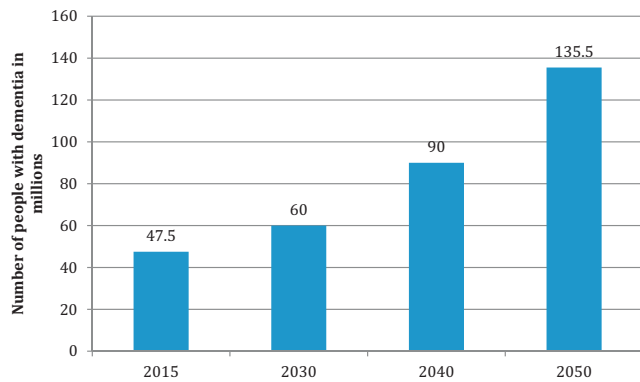
in the following fifty years (Benacova and Valenta, 2009). This brings about serious problems such as occurrence of diseases connected with aging population (Berger, 2011). The most frequent aging disease seems to be dementia (Pohanka, 2011). Currently, about 47.5 million people are suffering from this disease worldwide and every year this number is increasing by

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**Fig. 1 – The rise of people affected with dementia worldwide in the period from 2015 to 2050 (authors' own processing).**

new 7.7 million. It is expected that by 2050 the number of affected people will be three times higher, approximately at 135.5 million (Langa, 2015). Fig. 1 below illustrates the rise of people affected by dementia worldwide in the period from 2015 to 2050.

The most common type of dementia is Alzheimer's disease. In Europe it is the main cause of death (de las Cuevas et al., 2010). It is a kind of progressive neurodegenerative disease (Nieoullon, 2011; Drtinova et al., 2014). In reality the affected people start forgetting things because their nerve cells in the brain die. Other symptoms besides the memory include thinking disorders, impaired communication, changes in behavior, ill orientation, or difficulties in walking and eating (Shivanand, 2009). Recently there has been a new division of Alzheimer's disease thanks to the use of diagnostic technologies. These stages are as follows: preclinical Alzheimer's disease, mild cognitive impairment (MCI) due to AD and dementia due to AD. This last stage contains in itself all the stages of Alzheimer's disease which have been used so far (i.e., early/mild period; middle/moderate period; late/severe period) (Sperling et al., 2011).

#### **Preclinical Alzheimer's disease**

This is the period when people can be diagnosed with some changes in the brain, which might be the first symptomatic indications of the onset of Alzheimer's disease. But people still do not have any thinking or memory difficulties. The changes in the brain just point out that the first signs of Alzheimer's disease may occur 15 or 20 years before this disease breaks out (Alzheimer's Association, 2015).

#### **Mild cognitive impairment due to Alzheimer's disease**

In this phase people have mild thinking disorders which are noticeable to other people such as their relatives or friends, including the affected people themselves. However, these people can do their daily activities without any help. Research studies show that about 10–20% of people who are 65+ years old suffer from MCI nowadays. It has been also proved that a half out of 15% of people who notice their thinking difficulties

and see the doctor about this issue develop dementia within three or four years (Lopez et al., 2003; Roberts et al., 2008). It is recommended that people with MCI should undergo biomarker testing in order to discover whether there is a risk of developing Alzheimer's disease or not. It is said that those who do not usually suffer from the memory loss are most unlikely to develop this disease (Petersen et al., 1999).

#### **Dementia due to Alzheimer's disease**

This phase in fact includes all the symptoms of Alzheimer's disease such as a loss of memory, impaired communication, logical reasoning, a lack of social skills (McKhann et al., 2011). In many cases people also have neuropsychiatric problems such as deep depression, apathy, hallucination, inappropriate behavior, or sleeping disorders (Lyketsos et al., 2002). Therefore these demented people are not able to carry out their daily activities and have to rely on the assistance of other people, usually their relatives who also become their caregivers (Ferris and Farlow, 2013). In the worst cases people suffer from swallowing and walking difficulties, which eventually results in death.

Therefore the purpose of this article is to explore the preventive, non-invasive, intervention strategies which can help these people already in the preclinical period of AD to lower the risk of cognitive decline and thus, enable them to stay independent on the assistance of other people and constantly attempt to improve quality of their life even in the older age.

### **Materials and methods**

The methods of this review study include a method of literature review analyzing the data contained in the world's prestigious scientific database: Web of Science in the period of 1990–2014. The analysis concentrates on the occurrence of the key words: Alzheimer's disease and preventive strategies; and Alzheimer's disease and non-invasive strategies. The research studies were classified according to their relevancy. The key words were as follows:

- Alzheimer's disease AND preventive strategies (the number of results 151);
- Alzheimer's disease AND non-invasive strategies (the number of results 21).

The authors researched these studies, however, in the first case most of them were connected with pharmacological treatment and in the second case they were associated with non-invasive diagnostic tools. Nevertheless, the aim of this article is to examining preventive, non-invasive, intervention strategies in lowering the risk of cognitive decline which was done by comparing different research studies on this topic found also in other databases such Scopus.

#### **Current treatment of AD**

Present treatment can for some time delay the development of AD but it cannot stop it. There are altogether four approved

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