SELECTED RESEARCH STUDIES IN ALZHEIMER'S AND DEMENTIA TREATMENT

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Abstract

As people get older, higher attention is focused on the population ageing issues and its social and economic consequences, involving health and health care. On the positive side, people live longer lives as the life expectancy has increased as a result of reduced infant, child and adult mortality. On the other hand, with the increasing share of older people in the populations the share of old people suffering from chronic diseases is also growing. Mental health problems and behavioural disorders belong to the most common disabilities worldwide. It is considered that there are currently 7.3 million people living with dementia in Europe. Alzheimer's disease (AD), a neurological disorder, is the most common form of dementia (56% of all cases) and is one of the major diseases affecting world health. Every five years beyond age 65 the risk of developing the disease doubles. From this reason it is important to understand what is happening with the age profile of the population. Early diagnosis may be one of the key successes in the treatment of mental disorders. Submitted article deals with the current stage of research knowledge and drug treatment in the field of dementia and Alzheimer's disease.

Key words: Alzheimer's disease, Dementia, Population ageing

JEL Code: I1, J14

Introduction

Population ageing is a worldwide discussed topic and its role won't be less important in the future because ageing is taking place in almost all countries in the world. Worldwide the share of people aged 60 years and over was 11.7% in 2013 and is expected to grow to 21.1% in 2050. As the proportion of the world population is growing, the share of old people is also increasing. Age is considered to be one of the main risk factors of ill health among the elderly. The number of old persons aged 60 years or over is expected to rise from 841 million people in 2013 to more than 2 billion people in 2050 (United Nations, 2013).

The greatest risk factor for Alzheimer's disease and dementia is advancing age. Population aged 85+ is at greatest risk of developing Alzheimer's disease (the chance is almost 50%). According to American studies, about 5 million Americans aged 65 years and over, may have Alzheimer's disease and that number is expected to double for every 5-year age interval beyond age 65. The number of people living with dementia could double in the next 40 years with an increase in the number of Americans who are age 65 or older − from 40 million today to more than 88 million in 2050 (National Institute of Neurological Disorders and Stroke, 2015). While dementia is more common with advanced age, it is not a normal part of aging. Nevertheless, as the proportion of old people is high the present days, the number of patients suffering from this disease becomes also more significant.

1 Introduction to Alzheimer's disease

Alzheimer's disease was named after Dr. Alois Alzheimer, a German psychiatrist and neuropathologist, who in 1907, after the death of his patient Auguste D., first described the unusual brain changes that had not been recognized before. Shortly after the description of the first case, Emil Kraepelin (1909) introduced the diagnostic term Alzheimer's disease as plaques and neurofibrillary tangles occurring in the brain of a patient with presenile dementia (Hippius, 2003). However, due to the fact, that the number of patients suffering from this disease was very rare, there was no extra research in Alzheimer's disease till 1980s.

After the historic discovery in the 1980s that plaques were comprised of the beta-amyloid (Aβ) protein, scientists found that the Tau protein made up the tangles in Alzheimer's (Alzheimer's Association, 2015). Another important period in research progress was in 1990s, which was the decade of genetic discoveries. Beta-amyloid gene is producing the beta-amyloid protein and then when the gene mutated causing the disease. In 2000s, advances in drug development and brain imaging were reached. The ability to use an animal model for Alzheimer's disease is greatly accelerating drug development. One of the most hopeful procedures is infusing antibodies through vaccination that may attack the beta-amyloid in the brain. Until recently it has been relatively invisible to our technologies to see what is happening in the brain. In recent years, great progress has also been made in the ability to see inside the brain of Alzheimer's patients using the functional magnetic resonance imaging that can capture the earlier stage of the disease and offers a hope for better treatment.

It's obvious to say that it's easier to treat a sick cell than a dead cell – target is to find a drug that slows down the disease (Alzheimer's Association, 2015).

1.1 Understanding mental health and brain changes

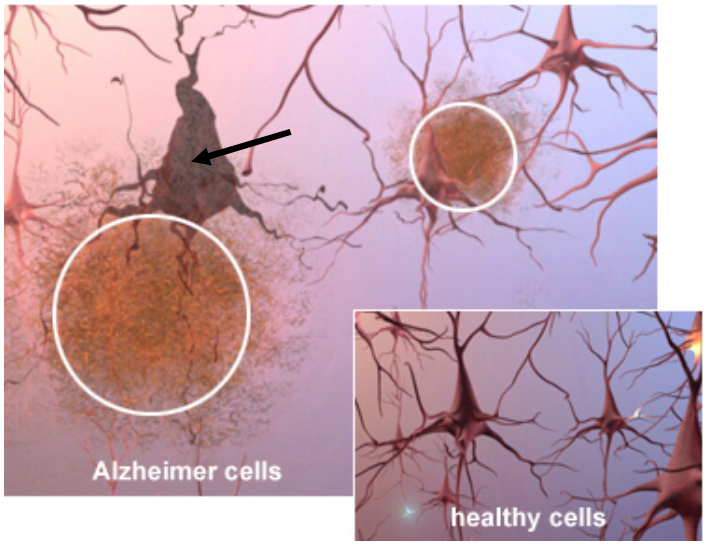
"Dementia is the loss of cognitive functioning, which means the loss of the ability to think, remember, or reason, as well as behavioural abilities, to such an extent that it interferes with a person's daily life and activities" (National Institute of Neurological Disorders and Stroke, 2015).

"Dementia is a syndrome – usually of a chronic or progressive nature – in which there is deterioration in cognitive function (i.e. the ability to process thought) beyond what might be expected from normal ageing. It affects memory, thinking, orientation, comprehension, calculation, learning capacity, language, and judgement" (WHO, 2015).

"Alzheimer's disease is a neurodegenerative disease, which slowly and progressively destroys brain cells. It affects memory and cognitive function, which may lead to confusion, changes of mood and disorientation in time and space. As the most common form of dementia, it affects between 60 and 65 percent of people with dementia" (Alzheimer Europe, 2014).

"Dementia is a general term for a decline in memory or other thinking skills severe enough to reduce a person's ability to perform everyday activities. Alzheimer's is the most common form of dementia that causes problems with memory, thinking and behaviour. Alzheimer's is a progressive disease, where dementia symptoms gradually worsen over a number of years" (Alzheimer's Association, 2015).

Figure 1: Imaging plaques and tangles under the microscope



Source: Alzheimer's association, 2015

The effects of Alzheimer's disease are visible when we look at the brain under the microscope (Figure 1). Nowadays, plaques and tangles are considered to be the main suspects in damaging nerve cells. Plaques are abnormal clusters of the beta-amyloid protein between the nerve cells. Dying and dead nerve cells contain tangles that are twisted fibres of the Tau protein and form inside cells (Alzheimer's Association, 2015).

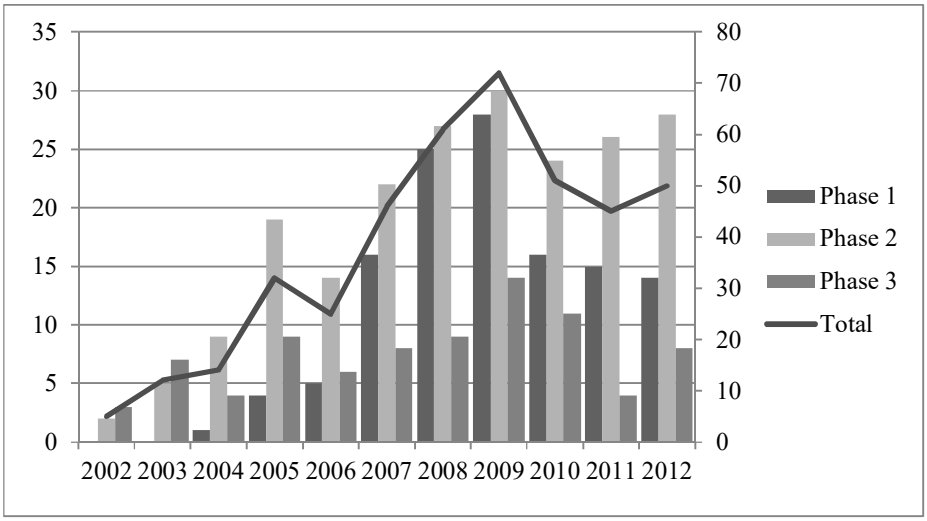
1.2 Early diagnosis of the disease and current success in drug development

Usually, Alzheimer's disease is diagnosed among older people aged 65 years and over; this is the so-called late-onset Alzheimer's. On the other hand, early-onset Alzheimer's may occur among younger people at younger ages (less than 65 years). For this reason, Alzheimer's disease is not just a disease of old people, even though mainly old people are affected by this disease (Alzheimer's Association, 2015). Memory loss, loss of cognitive abilities, problems with daily life activities belong among the main symptoms of the disease. At the progressive phase of the disease, a person suffering from the disease becomes dependent on family members, relatives, social workers and other caregivers.

Alzheimer's disease represents a common disease as global population is ageing and will be increasing as the share of old people will grow. There have been many studies and clinical trials in drug development that may prevent and slow the progression of AD. However, the process of drug development with obtaining positive results for preventing and delaying AD is very difficult and long-lasting. Currently, five drugs are permitted as appropriate for the treatment of AD: four cholinesterase inhibitors (donepezil, galantamine, rivastigmine, tacrine,) and an N-methyl-D-aspartate (NMDA) receptor AD antagonist (memantine) (Hyde, C., Peters, J., 2013; Howard, R., McShane, R., 2012).

The majority of clinical trials have been realized in the United States. During the followed period 2002-2012, altogether 413 AD clinical trials were introduced by Clinicaltrials.gov, which is a database capturing ongoing clinical trials. Phase 1 included 124 trials, Phase 2 involved 206 trials and Phase 3 comprehended 83 trials (Table 1). The total number of trials was the highest in 2009 (72 trials – 28 from Phase 1, 30 from Phase 2 and 14 from Phase 3) and the lowest in 2002 (Cummings, J. et al., 2014).

Table 1: Development of clinical trials in Alzheimer's disease



Source: Cummings, J., 2014

The last decade wasn't very successful from the view of finding the appropriate treatment or drug. From this reason the latest news are very promising. According to the newest results, presented at the Alzheimer's Association International Conference held in Washington this year, a new drug called solanezumab has shown possible positive results in slowing down the AD progression. Solanezumab attacks the damaged beta-amyloid proteins and neutralizes them. Although the latest presented results are promising, final confirmation will be stated after the final clinical testing, which should be completed in 2016. However, it will take 18 months to wait for the results of phase-three study (Karran, E., 2015). In my opinion, high importance should be given to the prevention of dementia, including physical activity, healthy food and lifestyle, keeping stress to minimum, regular cognitive activities, sleep. There is nothing more important than thinking about ones future mental health status in time.

The study of Alzheimer's disease and dementia is difficult because of finding the right data that can be analyzed and compared. The future expansion of this article will focus on the statistical analysis of selected datasets, including health variables regarding cognitive function and mental health. Some selected statistical methods will be used, e. g. cluster analysis, used in (Löster, 2014).

Studying mental health at older ages is necessary as populations are ageing, proportion of people aged 65+ is increasing and subsequently the share of old people suffering from mental diseases will be also growing.

According to projections for the Czech Republic in 2050, the number of seniors aged 65-74 years will increase by 50%, the number of seniors aged 75-84 years will grow by almost 94% (Stejskal, 2014).

Conclusion

Alzheimer's and dementia epidemic will remain as highly and advanced explored research areas. In the following years, it is going to be the collective task of researchers to collaborate, share and discuss the possible solutions, innovations, developments, results, theories that may help in improvement of AD treatment. However, we should take into account the high current and future treatment costs of mental diseases as well as the important and irreplaceable role of family members taking care of the patients.

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