Adaptable Risk Factors in the Prevention of Alzheimer's Disease

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Abstract

Alzheimer's disease (AD) affects five million people in the United States. The most significant risk factor for AD is age, but many adaptable factors may offer complementary treatment options with drug therapies. Diet, smoking cessation, moderate alcohol intake, exercise, cognitive activity, and control of comorbidities may have an impact on AD treatment and prevention. The Alzheimer's Association predicts that by the year 2050, there will be more than 16 million people with Alzheimer's disease. Adaptable factors should give hope to the millions of people who have or will have the disease.. Alzheimer's research has been inconclusive in many areas, but the control of vascular disease shows promise. Future research will add credence to previous findings. The ongoing Midlife Intervention for Dementia Deterrence Trial is designed to provide 600 individuals with online education intervention to reduce the risk of dementia. The outcome of this trial may confirm the findings of previous studies that have indicated healthy lifestyle changes reduce the risk of dementia and cognitive diseases; thus, giving hope to Alzheimer's patients and a practical, noninvasive, adjunctive therapy to physicians in reducing the incidence of AD and other cognitive disorders.

Keywords: *Alzheimer's; Dementia; Lifestyle; Prevention; Vascular Disease*

Abbreviations

AD: Alzheimer's Disease; BMI: Body Mass Index; FINGER: Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability; In-MINDD: Innovative, Midlife Intervention for Dementia Deterrence; LIBRA: Lifestyle for Brain Health

Introduction

Alzheimer's disease (AD) is the most common type of dementia among adults [1,2]; it affects five million people in the United States [2,3]. This debilitating disease is growing in prevalence; thus, there is an increasing interest in finding a cure due to the growing elderly population—the population most at risk for the disease. Age is the highest risk factor for AD [4,5]. Other non-adaptable risk factors include genetics and sex; however, there are adaptable factors that show promise for the prevention and treatment of AD. These adaptable factors have been gathered from observational studies: diabetes mellitus (DM), smoking status, activity level, cognitive activity level, and diet [3]; in addition to preventive measures to reduce vascular diseases [5,6]. The supposition that adaptable factors may benefit AD patients by preventing or delaying the disease has led to a comingling of treatment methods and prevention efforts, relying on medication and behavioral changes [3,6].

Prevention

Current drug trials focus on anti-amyloid or tau-targeted therapies. However, studies have shown that behavioral or lifestyle changes do not impact amyloid or tau plaques and proteins despite lessening the risk for AD [7]. This finding has led researchers to posit that lifestyle choice may have benefits beyond those of current drug therapies. Also, researchers are considering customized approaches to an AD patient's treatment and prevention efforts [3,6]. Comorbidities can reduce the effectiveness of drugs; thus, lifestyle modifications that reduce comorbidities could enhance the efficacy of drug therapy. It has been estimated that modifying lifestyle factors could reduce the risk of AD by half [3,5,7].

Adaptable factors

There is a plethora of research available regarding the prevention and treatment of AD through adaptable factors. However, much of the literature is inconclusive regarding what degree each factor impacts an individual's predilection to AD. Vascular health [8,9] appears to be a promising identifiable factor; other research has shown physical and cognitive activities to be helpful.

Diet

Diet as an adaptable risk factor for AD is difficult to research. The effects of diet are broad, as well as the varieties of eating habits. A study by Daviglus *et al.* (2011)—data analysis from MEDLINE and Cochrane Database of Systemic Reviews—contained all AD studies with a sample size over 300, an age range over 50, and an AD diagnosis distanced at least two years from a dementia diagnosis. In this study, the effects of diet on AD were inconclusive. Also, the results showed no association in AD with the intake of vitamin E, vitamin C, flavonoids, beta-carotene, essential oils, gingko biloba, or a Mediterranean diet. These variables were chosen as they were previously believed to have had a risk-reduction affect. Fruit and vegetable intake showed a mild risk-reducing effect in AD; whereas, the intake of saturated fat appeared to increase the risk [10,11]. As this study comprised a review of the literature in 2011, further research and review are needed to reach a more contemporary conclusion regarding diet and dietary supplements as risk-reducing agents in AD.

The Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) [12] studied the effect of diet (and other variables) on vascular disease and AD prevention. The FINGER study found statistically significant evidence that diet helps protect against dementia, and increased cognition; however, diet did not increase episodic memory [3,11]. The results were encouraging but stopped short of confirming diet as a prevention tool against AD.

Smoking and alcohol

Smoking and excessive alcohol use are generally accepted as having negative impacts on nearly all aspects of human health. However, nicotine has shown some neuroprotective traits as has mild to moderate alcohol use. Nevertheless, excessive alcohol intake creates cognitive impairments that could lead to AD. Also, there are thousands of chemicals in cigarettes that have been proven to cause neuronal degeneration, oxidative stress, and plaque formation [1]. The Daviglus *et al.* (2011) study claimed that smoking is a risk factor for AD among current smokers more than former smokers; the report was inconclusive regarding alcohol habits. The authors stated that those who had stopped consuming alcohol might have ceased doing so due to health issues associated with cognitive impairment [5].

Physical activity

According to research performed by Galvin (2017), physical activity reduced the risk of AD by 20–65 percent, depending on how regular and strenuous the exercise was performed [3]. Exercise decreases the risk for AD comorbidities (e.g., vascular disease) by increasing respiratory function and decreasing oxidative stress and inflammation [2]. The Daviglus *et al.* (2011) study was inconclusive regarding the effect of exercise on AD [5]. Exercise commonly has the effect of Body Mass Index (BMI) reduction, which could indicate less risk for dementia. However, dementia typically causes weight loss up to ten years before dementia onset; thus, BMIs are not a reliable indicator to in this regard [1].

Cognitive activity

Cognitive activities are considered activities that keep the brain active and are especially useful for people who cannot engage in physical activity due to the loss of mobility. These cognitive activities may include crosswords, arts and crafts, and computer use, if the computer is used for an engaging activity. Research by Galvin (2017) revealed neuroprotective effects with cognitive activity [2]. In research undertaken by Daviglus *et al.* (2011), cognitive activity also showed protective benefits, but it did not support a theory that this type of activity might be of benefit in early AD [4]. It appears that cognitive activity must be sustained to be useful in the prevention of AD and other cognitive diseases [4,10].

Comorbidities

The reduction of comorbidities enhances the beneficial effects of other adaptable factors. Vascular disease can have a significant adverse impact on AD. Sixty-four percent of people over 65 years of age, who have had a stroke, suffer from cognitive impairment. Thus, if strokes are prevented, the incidence of cognitive impairment, including AD, could be reduced dramatically [4,10,11]. This stroke-AD connection indicates that the control of cholesterol, blood pressure, and diabetes is factorial in reducing the advancement of AD.

In one study, hypertension was an increased risk factor; however, it was only a risk factor among those who were at an age of heightened risk of AD [1,12], notwithstanding stroke. The Daviglus *et al*. (2011) study confirmed an association between hypertension and AD, if systolic pressure was greater than 140 mm Hg [5].

Current Research

The Alzheimer's Association has predicted that by 2050, more than sixteen million people will have developed Alzheimer's disease [13]. The Alzheimer's Association has supported the National Alzheimer's Project Act to find "disease-modifying" treatments by 2025 [3,13]. These treatments will likely include lifestyle activities that reduce the adaptable risk factors of AD. The Lifestyle for Brain Health (LIBRA) project found that a one-point increase in a LIBRA score resulted in a 19% increase in risk of developing dementia [14]. This result is compelling and credible, as it was based on a 16-year study. A subsequent and ongoing study involves online education intervention to reduce the risk of dementia, known as the Innovative, Midlife Intervention for Dementia Deterrence (In-MINDD) [3,15]. The results of this trial may confirm findings from earlier studies that showed lifestyle changes could favorably impact the risk of dementia and other cognitive diseases, such as AD.

Conclusion

There are specific adaptable risk factors that can beneficially affect the disease process in Alzheimer's. While drug treatments have shown some success, Alzheimer's is increasingly impacting the growing aging population. Diet and exercise are known factors that modify the risk of developing other conditions, particularly metabolic and age-related diseases. Controlling blood sugar levels could reduce the risk of stroke, which then might reduce the risk of dementia or AD. Exercise can help a person look and feel better; knowing that it may help prevent or delay cognitive decline is a significant added benefit to exercise. Further research is needed to confirm if there are adaptable risk factors that can positively impact Alzheimer's disease, and possibly enhance the efficacy of current drug treatment for AD or reduce the dependence on pharmacological intervention in Alzheimer's disease and related cognitive disorders.

Conflict of Interest Statement

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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