Prevention of Dementia in Elderly Population: A Comprehensive Review of Literature

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Abstract

Background and Aims: Dementia is the loss of cognitive functioning – remembering, thinking, and reasoning – and behavioral capabilities to such a degree that it interferes with an individual’s daily living activities. The objective of this paper is to summarize current knowledge on the most promising interventions for preventing cognitive decline. Methods: Electronic databases were searched using PubMed/Medline and Google Scholar to retrieve relevant research papers conducted in Saudi Arabia and internationally. Keywords included “dementia,” “prevention strategies,” “aging,” “aged,” “Elderly population.” Articles published in the English language and published between 2000 and 2018 were included in the study. Analysis: Overall, limited evidence exists to support the cause-effect association between the progression/development of dementia and preventative strategies. Studies to date provide the most promising strategies for dementia prevention that includes healthy diet, social engagement, physical activity, cognitive activity, and vascular risk factor control. Conclusion: Dementia is a disease more commonly observed in old people. Studies in the future will determine the risk factor modification and its implications in controlled trials with specific emphasis on whether some simultaneous interventions may either have a multiplicative or additive effect.

Keywords: Aged, aging, dementia, elderly population, old adults, prevention strategies

Introduction

Dementia is considered as a principal reason for disability and dependence among aged population globally.\(^1\) It is a public health issue which contributes toward the spiraling health-care cost. The World Health Organization (WHO) projected that the number of individuals suffering from dementia over the next 20 years will double globally.\(^2\) Based on the Saudi Census 2011, the life expectancy at birth was 74. Considering this huge care burden and cost related to dementia management, it is an important priority in health care to decrease the number of new cases/incidence, delay its onset, as well as lessen the adverse emotional, personal, in addition to societal effects on family, patients, peers, and carers.\(^3\) Given an expected increase in the incidence or prevalence of dementia and rapidly increasing number of old people getting impacted by dementia, the identification of the successful treatment and prevention strategies is crucial.\(^4\)

Dementia is defined as a significant cognitive decline in comparison to the prior performance level in one or more domains (complex attention, executive functions, learning and memory, perceptual social, or motor cognition).\(^5,6\)

All areas of daily living get affected over the course of the disease. An individual with dementia often loses the capability to learn new information, plan the future, or make decisions. Communicating with other people in this condition often gets hard. Patients with dementia may lose their capability of undertaking routine task and to recognize the world around them. Moreover, dementia is frequently accompanied by deficits in gait and balance,\(^7,8\) that appears to be exclusively affected in some types of dementia, for example, “vascular dementia, Parkinson’s disease dementia, or dementia with Lewy bodies as compared to Alzheimer’s disease (AD).” AD is the most common subtype of age-related dementia.

Pharmacological treatment is observed to benefit dependence in activities of daily living (ADLs) and cognitive functions.

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in dementia patient, however, the side effects are common.\[9\] There is need to modify treatment to preserve independence and optimize cognitive functions in dementia patients, assuming the considerable dementia burden for society, family, and individuals.\[10\]

Previous literature demonstrates that some preventive measures may prove to be effective in delaying or preventing progression of mild cognitive impairment (MCI) to dementia, for example, Mediterranean diet/cognitive stimulation, controlling cardiovascular disease (CVD) risk factors, and physical activity.\[11,12\] There is a pressing requirement to advance the understanding of modifiable protective factors against cognitive impairment even in old age. The recent pharmaceutical dementia treatment can only modestly improve the symptoms, but cannot prevent or cure dementia. Consequently, dementia prevention by means of risk factor modifications and identification is of highest significance until the disease-modifying agents are proved to be effective. This article aims to review current literature on interventions with a possible role in the cognitive syndrome prevention. Specifically, the strategies that target modifiable risk factors, having a possibility to act before the disease inception and enhancing the cognitive reserve of healthy population or delaying the progression of neuropathological variations characteristic of dementia will be discussed. The focus was therefore on risk factors most strongly associated with dementia, namely, cognitive training, physical activity, social engagement, diet and nutrition, and vascular risk reduction.

**Methods/Search Strategy**

A comprehensive review of literature on effective approaches that may hold promise for prevention of dementia was performed. An electronic database search for literature from PubMed/Medline and Google Scholar was undertaken. Medical Subject Headings terms used in the search strategy included “dementia,” “prevention strategies,” “aging,” “aged,” “old.” Articles published in English language and published between 2000 and 2018 were also included. All searches were cross-referenced. Full text of research articles was reviewed.

**Results and Discussion**

**Physical exercise and dementia prevention**

Physical activity is a comprehensive terminology that refers to any movement of the body that compel a person’s muscles to work and expand energy.\[13\] It encloses lifestyle activities such as walking, gardening, household chores, or any incidental movement. Considering it to be a comprehensive term, physical activity also includes planned and structured actions such as exercise or sports. The terminology “exercise” is considerably more detailed and is well defined as a repetitive, structured, or planned physical activity, that helps to maintain and improve physical fitness. It helps to maintain and increase physical as well as mental well-being and quality of life of elderly individuals. The role of physical activity is becoming increasingly imperative to protect health in addition to adopting an active lifestyle in individuals with dementia. Exercise is effective in the chronic disease prevention and has a potential to diminish the risk of falls, maintain functional ability, reduce physical decline, or prevent injuries.

At present, there has been an emerging interest in physical activity as a nonpharmacological treatment for dementia.\[14\] Thus, some evidence indicates that regular physical activity often affects the cognitive or physical functions of the dementia patients,\[15,16\] ADL’s,\[17\] and quality of life.\[18\] On the contrary, a sedentary lifestyle/physical inactivity is usually related to an enhanced risk for metabolic aberrations, CVD, and several other adverse health conditions that primarily act as mediators in the progression or early onset of dementia.\[19,20\]

The WHO recommends that all adults should be engaged for as minimum as 30 min of moderate-intensity physical activity (accrued in bouts for at least 10 min) on 5 or more days in a week.\[21\] Patients with dementia are also encouraged to get engaged in routine physical activity along with avoiding an inactive lifestyle. Conversion from sedentary state to becoming physically active perhaps offers the most substantial favorable health benefits, physiological changes, and quality of life improvements.\[22,23\] The decrease in physical activity levels may become a risk factor for the elderly individuals with dementia.\[24\] While physical activity and exercises help reduce symptoms of the disease and increase cognitive functions at all stages of dementia, they can also improve the quality of life of aged individuals.

Plenty of anecdotal global evidence exists regarding the benefits of exercise and physical activity on the patients of dementia. A randomized controlled clinical trial (RCT) was conducted to examine the consequence of physical activity on the rate of cognitive decline among individuals with AD. The study examined if physical activity lessens the functional or cognitive decline rate or progresses the well-being in community-dwelling individuals with a diagnosis of either mild or moderate AD. This research also examined if such intervention reduces the care burden or eases stress.\[25\] Limited or no Saudi studies have yet demonstrated this association.\[26\]

Another “Cochrane review of randomized controlled trials” conducted in 2013 for dementia people reported that promising evidence exists showing that exercise-related programs may have a noteworthy impact in refining aptitude to undertake actions of daily living and perhaps may assist in improving cognition. The reviewed research articles showed no significant effect on the behaviors of depression or dementia, or on carer’s burden, mortality, and thus, reducing the utilization of health-care services. Additional well-designed investigation is needed to inspect these results and to examine the good quality exercise programs for individuals with severe and different dementia types.\[27\]

Gardening is an opportunity for old people to get exposed to or enjoy physical activity.\[28\] In this process, the elderly population often love to maintain care for plants and trees, extract leaves, grow, or water plants. The elderly population like to see the
plants grow on their own, that offers them a possibility of staying physically active ultimately resulting in an improved self-confidence. For all stages of dementia, garden work is evidently considered as the most enjoyable physical activity.

Some of the primary barriers for the general population to stay physically active include existing health issues, lack of time, stress, environmental factors, and cultural issues. Dementia patients living both in residential aged care facilities or at home, face several barriers to remain physically active or take part in exercises due to negative attitudes regarding their capability, stigma, and a principles of risk aversion in aged care.[29]

**Mediterranean diet and dementia prevention**

This type of diet includes some kinds of behavioral or nutritional recommendations that have been enthused by the lifestyle in addition to food of the coastal regions of the Mediterranean areas in the year 1960. This type of a diet comprises of fish, dairy products, olive oil, plant foods, fresh fruit, whereas processed foods, red meat, and salt should be limited. Some of the cohort studies scrutinized a link between cognitive decline of dementia[30-32] and Mediterranean diet. This diet exposure was evaluated with self-recorded food questionnaires, whereas another article described more adherence to the Mediterranean diet accompanied by a risk of progression from cognitively normal persons to MCI.[33-36] The individuals exposed to the Mediterranean diet were found to have improved scores on the “Mini-Mental State Examination” and demonstrated a lesser amount of decline on a memory test.[32] This mechanism is possibly associated with the role of antioxidants that are found in the diet and its possible association at limiting the reactive oxygen species.

**Social engagements**

Social engagement is referred to as maintaining social connections and taking part in social activities. Marital status, contact with friends and family have been used as variables by several evidence to quantify and measure the extent of social engagement plus its relationship with cognitive decline and AD. Many cohort studies in Saudi Arabia, Europe, and US have examined social engagement as a potential risk for the future AD development.[33-36] These studies reveal that prospectively observing populations for many years using self-reported questionnaires suggest that social activities might be protective contrary to developing a cognitive decline. Specifically, failing to cohabitate with life partner or being single has been linked with an amplified risk for dementia; nevertheless, such results cannot be applied to people who are widowed or divorced. Decline in social networking, and activities, and degree of loneliness is thought to be related with a high risk.[37-

For interpreting these findings, some caution is warranted since decline in social engagement may turn out to be the first sign for dementia instead of being a risk factor.[38] Patients with early dementia may have reduced social activity since they are less functional and tend to frequently withdraw.[39] Thus, this indication is not conclusive regarding a certain social activity, a practical notch of support is, however, observed for preserving social network. Subsequently, this recommendation is mainly offered by health professionals as a means of preserving a high quality of life.[40]

**Cognitive training**

Mental training and exercises may be considered as a potential solution to enhance the so-called brain reserve in later stage of life.[41] Most of the clinical trials were commenced to examine the cognitive training role in preventing or delaying the considerable cognitive decline.[42] Another study “ACTIVE” is thought to be an influential study which defined the role of cognitive training. This trial successfully examined effects of ten sessions weekly of cognitive exercises after recruiting “2832 elderly people” utilizing four primary tasks: wait-and-see controls, processing, reasoning, and memory. After following up for 5 years, this study showed that certain types of mental actions could help not only on the cognitive performance but also on instrumental daily living activities.[43,44] This task of reasoning was significantly protective contrary to decline in contributory daily living activities.

Other research articles have examined a multifaceted association between quality of life, depression, and cognitive training. A study conducted by Olazarar[45] demonstrated that cognitive training was thought to be more useful to maintain mood instead of enhancing cognitive capabilities. A SMART trial; therefore, showed that progressively enhancing training levels over the course of time was usually more effective at delaying cognitive decline as compared to utilizing either a standardized or a fixed training regimen.[46]

The advantages of cognitive training are considerably known to be domain specific. Many other trials found that cognitive training may help in improving the mental processing speed, reasoning, and memory in aged people,[47] however, it may not generalize across domains or may not affect daily functioning. In addition, elderly population with memory impairments may not be able to make improvements from memory trainings in comparison to those without such impairments. Thus, the influence of cognitive training in elderly population on the dementia risk is still not clear.[46] However, many ongoing trials are still underway to explore this association.

**Vascular risk factors**

Vascular diseases considerably predispose to the progression of dementia, for example, AD or vascular dementia. Thus, the amelioration of such conditions for vascular pathology for instance diabetes, hypertension, and dyslipidemia are considered as an essential target for the prevention of dementia. The association of dementia risk and antihypertensive treatment has been determined by RCT and observational studies. A systematic review found that antihypertensive medicines may cause a reduced risk of AD, vascular dementia, and cognitive decline from 19% to 55%.[48] Thus, the antihypertensive treatment effects on the risk of dementia are considerably weaker while only considering RCTs indicating the confounding factors and its presence. Another previously concluded meta-analysis indicated that antihypertensive treatment can lessen the risk for vascular dementia but not
cognitive decline or Alzheimer.\[^{49}\] Further more, negative results were found while examining the individuals without vascular disease demonstrating that medications that are antihypertensive can be more effective as a strategy for prevention if targeted at people having higher vascular disease risk. Among antihypertensive medication classes, a strong effect was examined for renin–angiotensin system modulators, that were likely to decrease dementia and cognitive decline risk along with slowing down conversion of MCI to dementia.\[^{50}\]

**Strengths and limitations**

The present review is the first review conducted in Saudi Arabia including contemporary international and local evidence on the most promising interventions for preventing cognitive decline. The review can be very useful resource document for health professionals concerned with preventing dementia. Although some limitations for the review exist. Human research articles face major challenges such as the inclusion of clinical heterogeneity of dementia syndromes, multiple confounding factors, and a requirement to correctly follow individuals and randomize over a long period of time. Considering these limitations, studies to date suggest that a multifactorial intervention strategy characterized by healthy diet, regular exercises along with vascular risk factors amelioration may be some of the most promising strategy to prevent cognitive decline.

**Conclusion**

Considering what types of biological and lifestyle factors may change the dementia risk is critical for disease prevention. Population-based studies have remarkably examined countless aspects that are essential in limiting the dementia risk, comprising of factors that classify individuals at dementia risk (depressive symptoms and vascular risk factors) or factors that might limit dementia risk (such as social activity, cognitive, vascular risk factor control, and diet rich in polyunsaturated fatty acids and anti-oxidants). Future research studies must, therefore, continue to assess the risk factor modification impacts on cognitive outcomes using controlled trials with specific emphasis on whether such concurrent interventions may either have a multiplicative or additive effect. Interventions combining different factors, for example, healthy nutrition with physical, social, or cognitive activity should also be explored in the future.

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**Conflicts of interest**

There are no conflicts of interest.

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