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Do cognitive stimulating activities help prevent the development of dementia in seniors living in Latin America?

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Introduction

Dementia is a term used to describe a group of symptoms that alter a person's intellectual functioning.[1] It is caused by a variety of illnesses and can lead to memory impairment, decreased problem solving and decision making capacity, and diminished ability to perform everyday activites.[1,2] It is estimated that approximately 50 million people worldwide currently have dementia and that number is expected to increase to 152 million by 2050.[2] A majority of that increase can be attributed to the rise in those living with dementia in low- and middle-income countries.[3]

Latin America has the highest rates of dementia with a prevalence of 8.5% among persons ages 60 and older.[4] Prevalence of dementia in ages 65-69 is twice as high as those in developed countries.[5] By 2050, approximately 30% of Latin America's population over the age of 60 will be living with dementia, the highest rate worldwide.[4] Several factors are contributing to this epidemiological change. Latin American countries have experienced a shift in demographics in which the elderly represent a large proportion of the population.[6] This demographic shift is happening at a considerably faster rate when compared to Europe and North America.[6]

Socioeconomic status and educational level are also contributing to the high rates of dementia in Latin America. The region's poverty rate is high, and the illiteracy rate among the elderly is around 10%.[5] Studies have shown that low levels of education, particularly illiteracy, are linked to higher rates of dementia.[6]

Although significant numbers of people are affected by dementia in Latin America, there are limited facilities and professionals trained to diagnosis and treat the condition.[7] Neurologists, psychiatrists, or gerontologists are typically the health care practitioners that make the diagnosis

of dementia in Latin America.[8] With healthcare facilities generally located in large cities, access to these specialists is scarce in small towns and rural settings. Furthermore, specialized services, like dementia care, are only covered by private insurance in most Latin American countries.[8]

Other factors contributing to the complexity of dementia diagnosis and treatment in Latin America are the lack of memory care clinics and the region's current model of care, which is focused on acute disease and hospital-based treatment.[7,8] This type of system is not suitable for the ongoing care of dementia patients.[7]

With projected number of those diagnosed with dementia expected to increase worldwide over the next few decades, there is growing interest in identifying successful strategies for disease prevention.[9] One area of focus is the concept of cognitive reserve. Cognitive reserve refers to the brain's ability to endure age-related changes and disease-related pathologies without developing symptoms of disease.[10] Cognitive reserve also explains the relationship between education level, reading ability, IQ, and dementia.[10] Participation in cognitive stimulating activities has become a potential source for sustained cognitive health and potential protective factor against developing dementia.[11]

This paper will explore whether participating in cognitive stimulating activities is helpful in preventing the development of dementia in seniors living in Latin America, a region of the world where low levels of education are prevalent. The goal of this analysis is to provide evidence-based recommendations on whether cognitive stimulating activities should be considered an effective preventative strategy for dementia and incorporated into current lifestyle regimens.

Background: Literature Review

Modifiable Risk Factors

Current research outlines several potential modifiable risk factors for developing dementia. A report by the National Institutes of Health identifies diabetes mellitus, smoking, depression, physical inactivity, poor diet, and cognitive inactivity as factors that increase the risk of cognitive decline.[9]

The Alzheimer's Association also lists similar modifiable risk factors for dementia. According to their review of published research, there is adequate evidence to support that regular physical activity, management of cardiovascular risk factors, healthy diet, and lifelong learning/cognitive training may reduce the risk of cognitive decline.[12] Their evaluation of modifiable risk factors reveals that the most consistent evidence in regards to reducing cognitive decline relates to the number of years of formal education a person has aquired.[12] Those with less years of formal education have been found to have a risk ratio of 1.99 for incident Alzheimer's disease compared to those with more years of education.[13]

The relationship between education and dementia has been widely researched over the past decade and the results have been mixed. Most research argues that low levels of education and high illiteracy rates are associated with earlier onset of cognitive decline and the development of clinical signs of dementia.[6] A systematic review and meta-analysis which analyzed 133 studies covering over 437,000 subjects, showed a strong link between low levels of education and dementia.[10] The pooled odds ratio of the prevalence studies included in the analysis was 2.61, indicating that those with low levels of education were 1.61 times more likely to develop dementia than those with higher education.[10] Incidence studies came to the same conclusion. The pooled odds ratio of 1.88 signified that those with lower education were 0.88 times more likely to develop dementia.[10] These figures corroborate the claim that individuals

with lower levels of education are more likely to develop dementia compared to those with a high level of education.

Studies have also shown that those with more education have a higher cognitive reserve and can better cope with pathologic changes of disease.[10] Some research findings have quantified the number of years of education thought to be protective against dementia. Completing more than 10 years of education or having a tertiary level of education were found to be significantly linked to reducing the risk of dementia.[14] Higher education is also thought to improve problem-solving and critical thinking skills and therefore build up cognitive reserve.[14] This improves the level of cognitive functioning and makes a person more resistant to cognitive decline.[14]

Generally speaking, mental stimulation early on and throughout life is thought to increase cognitive reserve and have a protective function against dementia.[10] Those that engage in lifestyle activities that impact cognitive function, such as higher education, are influencing their cognitive reserve by encouraging positive neuroplasticity.[15] The predominant theory is people are creating increased efficiency in their existing neural pathways as well as stimulating the recruitment of new compensatory pathways that are usually not used to complete a task.[15] This flexibility may allow for better resistance to age-related pathologies such as dementia.[15]

In one systematic review, a link between education and dementia was determined to be variable; more years of education did not necessarily lessen the risk of dementia.[16] The study found the relationship between the two factors to be complex. The review looked at studies published from January 1985 to July 2010 and found a more consistent relationship between education and dementia in more developed regions of the world versus in developing regions.[16] Factors such as age, gender, race/ethnicity, and geographical region were found to have an

impact on the relationship between the two.[16] The conclusion of the authors was that the education-dementia relationship may be uniquely influenced by a person's environment.

Education Level in Latin America

In 2014 The United States Agency for International Development (USAID) published a comprehensive analysis of education trends in Latin America and the Caribbean. Both literacy rates and education level were among the topics studied. The analysis showed that the majority of those living in Latin American countries complete primary school, however, only about half of young adults ages 20-24 finish high school.[17] In addition, only 42.3% of the population were enrolled in tertiary education in 2011.[17] Although illiteracy rates in Latin America are improving, they are still high among adults ages 50 and older.[17]

Cognitive Stimulating Activities

Cognitive stimulating activities have become an area of focus in research for dementia prevention. Studies have concentrated on the effects of education and the impact of increasing cognitive reserve to sustain cognitive health. Examples of cognitive stimulating activities that have demonstrated pro-cognitive effects include reading, participating in discussion groups, computer usage, puzzles, and playing musical instruments.[18]

An analysis that pulled data from the national Aging, Demographics, and Memory Study sought to explore two main domains of cognitive stimulating activities, literacy and visuospatial activities, and their relationship to education and cognition impairment. The study found that cognitive stimulating activities are beneficial for both cognitively intact and cognitively impaired individuals.[19] The study also revealed a significant interaction between literacy activities, education, and dementia. Individuals with higher education that engage in literacy activities were less likely to develop dementia.[19]

Data from a meta-analysis published in 2016 consistently demonstrated that participation in mentally stimulating activities reduces the risk of dementia and cognitive impairment.[11] Mentally stimulating activities were found to improve late-life cognition, memory, speed of processing, and executive functioning.[11] The calculated risk reduction of dementia for the studies included in the analysis ranged from 4% - 75%. These results suggest that cognitive stimulating activities have a protective effect on cognitive abilities.

Other studies have come to the same conclusion. One such study that followed 1,475 dementia-free seniors ages 65 and older for a period of up to 15 years, found that those with higher levels of activity were associated with a decreased risk of dementia.[18] Another study showed that not only do life-long cognitive leisure activities provide a protective effect but later-life activities reduce the risk of dementia as well.[18]

Cognitive training regimens have varied within clinical trials.[20] Parameters to consider when utilizing cognitive stimulating activities as a preventative measure for dementia include intensity, frequency, duration, and sustainability. One randomized controlled trial utilizing computer cognitive training as a potential restorative tool in adults with cognitive risk found cognitive improvement after completing three weeks of 30-45 minute sessions three times per week.[20] Less intense training, such as 10-minute sessions three times per week for six weeks, was found to have no cognitive benefit.[20] A review of other studies utilizing computerized cognitive training as an intervention found that adults with mild cognitive impairment were able to sustain the benefits of their cognitive training at 3 and 5 months.[20] This review, however, noted that longitudinal follow-up with the clinical trial participants was lacking.[20] Therefore, although the results of the trial show short-term benefit in sustainability, more studies need to be conducted with longer follow-up periods.

Implications of these research findings on cognitive reserve may include economic benefits[11]. Reducing the prevalence of dementia through interventions like cognitive stimulating activities, could mean billions of dollars of economic savings due fewer people needing high level of care.[11]

Methods

Research was conducted through the PubMed database. Key terms and phrases used in searches were 'dementia in Latin America', 'dementia prevention', 'cognitive stimulating activities', and 'education'. Studies and articles were sorted by best match and then filtered by publication dates. Any articles published prior to 2009 were excluded in order to focus this analysis on the most current data. An intentional effort to review varying study models was made. This included randomized controlled trials, systematic reviews, review articles, and meta-analysis.

Exclusion of articles was based on quality concern. Studies that did not have references were omitted. Studies that were accepted for review were read thoroughly and pertinent information was extracted to include in this analysis.

Statistics on dementia, dementia in Latin America, and education in Latin America were gathered from reputable sources including the Dementia Society of America, World Health Organization, Pan American Health Organization, and the United States Agency for International Development.

Interviews were conducted with Dr. Jose Alejandro Madrigal Lobo, a member of the Costa Rican Doctors' Association and with Susie Aguirre, a registered nurse working at Rafael Angel Calderon Guardia Hospital in San Jose.

Discussion

The aim of this research was to assess the effectiveness of cognitive stimulating activities on the prevention of dementia and whether they can be used as a means to reduce the risk of the development of dementia in Latin America, a region of the world where low levels of education are present. The intention was to explore the idea whether those with low levels of education can benefit from participating in cognitive stimulating activities in order to increase their cognitive reserve and therefore provide a mechanism of protection for dementia.

The theory of cognitive reserve has become an area of interest for dementia prevention. Cognitive reserve refers to the ability to maintain normal cognitive function in the presence of brain pathology. Those with higher levels of cognitive reserve have been found to be better able to cope with degenerative brain changes associated with diseases. Studies have shown that having a higher level of cognitive reserve is thought to be a protective measure against dementia.

The findings of this analysis show that participating in cognitive stimulating activities to improve cognitive reserve can be viewed as a valuable approach to reducing the risk of dementia. Cognitive reserve is developed over the lifetime of an individual through both education and other activities like puzzles, computer use, reading, and writing. Engaging in these cognitive stimulating activities is thought to have several benefits including better cognitive function and memory capacity as well as an increased resilience to dementia. Although majority of research finds that a high level of education equates to an increase in cognitive reserve, other factors to keep in mind that may have an influence on that attribute include a person's age, gender, race/ethnicity, and geographical region of residency.

The educational trend in Latin America is one where secondary and tertiary levels of education are not completed by most of the population. Knowing the significant effect that

education and stimulating cognitive activities have on cognitive reserve, it is reasonable to question how the lower levels of education may be impacting the occurrence of dementia in the region. It would be worthwhile to conduct research that compares the level of education in seniors with dementia living in Latin America to that of the education level of seniors with dementia living in regions of the world with high levels of education. Those results could then be used to reinforce the importance of education and cognitive stimulating activities in the prevention of dementia. Based on the research that has currently been done on cognitive reserve, it appears to be beneficial for seniors living in Latin America to utilize cognitive stimulating activities to reduce their risk of dementia.

Incorporating cognitive stimulating activities into geriatric care in Latin America looks to be complex. First, it would be important from a health policy perspective to recognize the role of cognitive reserve and its relationship to education, cognitive stimulating activities, and the development of dementia. Due to the lack of health care professionals trained to diagnose and treat dementia in Latin America, it is not difficult to speculate how hard it may be to bring attention to the need for dementia care at a policy making level.

One country in the region, however, has recognized its struggle with caring for those with dementia and has reached out for help. In a conversation with Dr. Jose Alejandro Madrigal Lobo (July 2019), a member of the Costa Rican Doctors' Association, he acknowledged that dementia care in Costa Rica is lacking. The country has been working with the World Health Organization to address the increasing prevalence of dementia within the country (J. Lobo, personal communication, July 1, 2019). Currently, only two out of the seven of the country's hospitals have the capacity to treat mental health diagnoses (J. Lobo, personal communication, July 1, 2019). In addition, Susie Aguirre, a registered nurse specializing in geriatrics and working at

Rafael Angel Calderon Guardia Hospital in San Jose, stated that she sees many patients with dementia, but that treatment options for them are limited (S. Aguirre, personal communication, July 3, 2019).

Other challenges exist in building capacity for dementia care in Latin America. Those include poverty, lack of advocacy groups, unstable political environments, and insufficient information technology infrastructure.[7]

Latin American countries have insufficient resources available to be used for capacity building.[7] Many health needs are competing for limited funds. This has led to an unequal distribution of healthcare services throughout the region, particularly in rural areas.[7] Healthy lifestyle programs, especially those aimed at the elderly, are uncommon in poor, rural areas.[7]

In addition, the governments in many Latin American countries are unstable and afflicted by perceptions of distrust, suspicion, and corruption. This has made it difficult to advocate for health policy changes that would positively impact those with dementia.[7]

Access to up-to-date medical and scientific data is insufficient throughout the region due to high costs and unreliable technology.[7] This makes it problematic to disseminate new information about diagnosis and treatment of dementia to healthcare providers.

These challenges make it difficult to establish competent dementia care in Latin America. One approach to addressing these challenges is to utilize public events to educate communities on dementia issues. The Interdisciplinary Symposium on Alzheimer's Disease and Related Disorders held in Venezuela for seventeen years was an event put on by healthcare providers and researchers to inform the public about dementia.[7] Topics such as signs and symptoms, risk factors, diagnostic strategies, and treatment options were covered.[7] Implementing events like this throughout Latin America may be one approach to informing healthcare providers and the public

about the importance of and relationship between cognitive stimulating activities and dementia prevention.

Another significant component to tackle in the prevention of dementia in Latin America is the region's low level of education. Completing primary school appears to be common, however, secondary and tertiary levels of schooling have lower enrollment rates. In most Latin American countries less than 1 in 10 adults ages 25 and older have a college degree.[17] Because research has shown that low levels of education are related to higher rates of dementia, this is an area deserving of improvement.

Conclusion

Demographic shifts have led to elderly individuals representing a large proportion of Latin Americas populations. This has created the setting for a considerable increase in the number of those living in that region with dementia. By 2050, the highest prevalence rate of dementia in those over the age of 60 worldwide will be in Latin America. A substantial factor contributing to the high prevalence of dementia in this region is education.

Low levels of education are common among those living in Latin America. Studies have shown that this level of education is linked to reduced cognitive reserve and therefore increased risk of dementia. Implementing preventative measures that involve education and improving cognitive reserve appear to be logical strategies to address this reality.

Research has shown that utilizing cognitive stimulating activities, like reading, writing, and puzzles, enhances cognitive reserve and provides a protective mechanism against dementia. Promoting participation in these activities by adults and seniors should be an important focus for dementia prevention initiatives in Latin America.

Although participation in cognitive stimulating activities has been found to reduce the risk of developing dementia, many challenges exist within Latin American that make implementing this preventative strategy difficult. More healthcare providers knowledgeable in dementia diagnosis and treatment are needed. In addition, more work needs to be done to improve and address the region's healthcare infrastructure, unstable governing bodies, and poverty levels in order to make implementing beneficial health initiatives plausible.

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