



Paper Type: Original Article

A Study on the Awareness of Families about the Prevalence of Alzheimer Disorder in the Elderly Population with and without Down Syndrome

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Citation:

Received: 2 June 2024

Revised: 28 July 2024

Accepted: 3 August 2024

Afrooz, A. G., & Rastegari, P. (2024). A study on the awareness of families about the prevalence of Alzheimer disorder in the elderly population with and without Down syndrome. *Psychology Nexus*, 1 (1), 28-36.

Abstract

Alzheimer's disorder (AD) is a condition in which neurons of the brain are damaged and will be lost gradually. Alzheimer's is caused by 60-70% dementia that interferes with short memory, thinking, and behavior. This is a heritable disorder and Tau proteins are involved in progression. The present review aimed to clarify the cause, treatment, and co-morbidities of Alzheimer's. This review discusses AD as a multifactorial disease. The diagnosis was addressed and Due to Alzheimer's common in Down Syndrome, some suggestions were provided for preventing and managing Alzheimer's. Neither Alzheimer's cured, nor Down syndrome is cured so, developing successful management for prevention is recommended. This review discusses current insights about Alzheimer's. In conclusion, people who suffer from Alzheimer's may experience many behavioral, functional, and communicative problems. It is necessary to train caretakers or nurses to improve the quality of life by accepting these conditions and supporting the suffering. Increasing self-value and quality of life may be facilitated by the coordination of all society members. In many developed countries, police officers are trained to learn how to treat people with Alzheimer's to avoid tension. We hope that in developing countries such facilitations will be implemented for the patients and their families.

Keywords: : Alzheimer, Dementia, Tau proteins, Down syndrome

1 | Introduction

Alzheimer's is not predictable and so far this disorder is not known for many people, so abnormal behaviors are interpreted as psychological disorders by others. The history of familiarity with Alzheimer's is short and the studies date back to 20 years ago.

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Shakespeare called old age the return of childhood and forgetting. Aloes Alzheimer who was a German psychiatrist discovered this disorder in 1906 so this disorder was registered as his name. Alzheimer's was recognized as a mental psychological disease until Dr. Alzheimer noticed changes in the brain of fifty years old woman after her death and analyzed memory loss and forgetting from a pathological view and concluded that this woman suffered from an unknown disorder.

Dr. Alzheimer recognized that the lack of coordination between thought and action resulted from the abnormal effects of this brain disorder. He didn't consider forgetting due to aging and studied the brain physically. He has concluded that "the brain of a person with AD becomes clogged with abnormal structures, called 'neurofibrillary tangles and senile plaques. The former refers to twisted masses of protein fibers inside nerve cells and the latter is composed of parts of neurons surrounding a group of proteins called beta-myeloid deposits. Furthermore, the persons affected with the disease reveal "an atrophy of brain tissue". MRI scans have projected atrophy of the hippocampus and amygdala in particular. Alzheimer's is the fourth leading cause of death in Western society and leads to tremendous human suffering and economic burdens. The annual incidence of AD in the USA is estimated to increase from 360,000 in 1997 to 1.14 million in 2047. Currently, at least 18 million people are suffering from AD around the globe [2].

The annual total cost of the disease is estimated to be up to \$91,000 per case [3]. Since the risk of Alzheimer's increases dramatically with advancing age, the prevalence of Alzheimer's is alarmingly on the increase. The demographic transition from young to old around the world is expected to lead to an exponential increase in the number of people suffering from Alzheimer's. Accordingly, there is an increasingly urgent demand for the development of effective therapies to treat Alzheimer's or delay its onset.

1.2 | Early Symptoms of Alzheimer

The onset of the disease is mistakenly attributed to the age-related disease or stress. At this stage, the affected person can hardly recall the new observed facts, which can be confirmed by cognitive and behavioral tests. The findings of [4] have illustrated that common symptoms of the sufferer at this stage include mood swings language breakdown, confusion, long-term memory loss, general withdrawal, irritability, and aggression.

Mosla et al. [5] have predicted that less than 3% of the diagnosed individuals live more than fourteen years. Despite the National Institute of Aging's recommendations in 2006—specifically, those regarding the adoption of non-invasive lifestyle habits in the prevention of disease complications based on maintaining a balanced diet and mental stimulation—no sensible and definite treatment has been found. It is worth noting that social, psychological, and physical burdens can prove unequivocally detrimental to the lives of caregivers of those with Alzheimer's. The first symptoms are varied. In general, symptoms are accompanied by a gradual reduction of the following:

- I. Memory.
- II. Reasoning and carrying out complex tasks.
- III. Language.
- IV. Perception of visual pictures and spatial relationship.
- V. Behavior and personality.

People who suffer from these symptoms are not able to recognize the reduction of memory capacity and this problem is recognized by others.

Stage of Alzheimer	First	Middle	Last
Description of symptoms	Symptoms are mild. Common symptoms are including forgetting new acquired information particularly related to events, places and names, difficulty in finding words for expressing thoughts, losing objects more than usual, difficulty in planning or organizing, difficulty in problem solving, taking long time in doing tasks.	This stage is very long and it may take many years and people in this stage need help and support. Memory lose is experienced more than before. Suffered people forget details of life like telephone number and place of their school, they don't know name of day and also they don't know season and place of living, they have poor memory, they have problem in knowing friends and family members, there are repeated story or thoughts or events, they cant solve math simple tasks, they need help for taking bath, clothing, toileting, etc, depression, anxiety and apathy are experienced, they may experience hallucination(suspicion to others), urinary incontinence, sleep problems.	Symptoms are severe and the suffered need more care and support. Symptoms are including losing memory, unaware of surrounding places, they need help in eating, sitting and walking, losing ability of communication, they speak with many words, they are sensitive and vulnerable to inflammation like pneumonia and skin problems.

Table 1. indicates symptoms in the first, middle, and last stages of Alzheimer's.

1.3| Leading Causes of Alzheimer

The abnormal formation of a protein in the brain is the main cause of Alzheimer's. Formation of these proteins called Tau and myeloid plaques leads to the death of neurons of the brain. The human brain contains more than 100 trillion neurons and cells. Neurons are essential for thinking, learning, memory, and planning. Scientists believe that the formation of myeloid protein in neurons leads to plaques and also intervened fibers may lead to nodes named tau so, tau and amyloid play the role of barriers between neurons and are cause of dysfunction of neurons. Reduction and death of neurons lead to Alzheimer's symptoms. Death of neural cells begins in one region of the brain (usually from the memory region) and gradually extends to other regions.

Despite available studies, scientists are not sure what the causes of these protein formations are. So far, scientists believe that genetic mutation makes the onset of Alzheimer's early. They believe that late-onset is due to brain changes during some decades. A combination of genetic, environmental, and lifestyle factors contribute to this disorder.

BFCNs degenerate in a variety of neurodegenerative disorders, including Alzheimer's [6], [7]. The selective vulnerability of the cholinergic system in Alzheimer's was first suggested in the mid-1970s based on the selective loss of cholinergic markers (ChAT and acetyl-cholinesterase; AChE) [8]. In spite of a wealth of observations that confirm the consistent presence of cholinergic deficits, the pathogenesis for cholinergic degeneration is still poorly understood, and there is little insight into the selective vulnerability of these neurons.

1.4| Is Alzheimer's Heritable?

Having trisomy 21 may increase the occurrence of early-onset Alzheimer's. This trisomy 21 is related to Down syndrome, it means people with this syndrome have an extra gene copy and a person with Down syndrome has 47 chromosomes instead of 46 normal chromosomes. This extra chromosome has effects on brain development. Although Down syndrome is a chromosome disorder, it doesn't mean it occurs during pregnancy or is heritable. Many cases of this syndrome occur accidentally and its heritage pattern doesn't pass during pregnancy or fertilization. When a mother is old (over 35 years old) or mother is under fertilization age, it will be a high-risk factor. This syndrome is characterized by physical, cognitive, and behavioral symptoms and symptoms are varied in different persons.

The responsible gene of amyloid protein is located on chromosome 21. When this protein is broken it will named amyloid beta. Deposits of amyloid beta and plaques in the brain are features of Alzheimer's. People with Down syndrome with an extra chromosome are at risk of Alzheimer's 5 times

more than normal people because they have high deposits of amyloid beta. It seems that the main cause of early-onset brain changes in Down syndrome is Alzheimer so a person with Down syndrome is more susceptible to Alzheimer's than the general population at an early young age (after 35 years old). In this line, the prevalence of Alzheimer's among Down syndrome in 35-49 years old, 50-59, in over 60 years old is 8%, 55%, and 75% respectively.

Also, Down syndrome is a chromosome disorder caused by the presence of an extra copy of chromosome 21. The disorder is intertwined with cognitive and physical impairment, which can be diagnosed during pregnancy or at birth by amniocentesis. According to [9], the syndrome can be identified by the observation of characteristic disabilities (ranging from mild to moderate) and an average IQ of around 50. Some physical characteristics of Down syndrome include short broad hands, furrowed protruding tongue, flat and broad face delayed sexual development, and harsh voice.

Bush and Beail [10] have demonstrated that a high risk exists of developing early-onset dementia of the Alzheimer type in the retarded who are aged over forty years. The issue of a link between Down syndrome and Alzheimer's arises when genes responsible for amyloid plaques and neurofibrillary tangles are found on chromosome 21.

Verbal skills are known as one of the remarkable bio-cognitive characteristics of Down syndrome. Such skills also play a paramount role in recognizing people with Alzheimer's. It is worth noting that those with Down syndrome generally experience premature Alzheimer's (30 yrs) compared to unaffected populations (60 yrs).

Afrooz's study on verbal skills of Down syndrome showed that the verbal skills of this population are lower than the normal population [11].

1.5 | Diagnosis of Alzheimer

There are many ways to diagnose Alzheimer's to determine whether there is memory loss or not because many conditions especially neurological conditions may cause Alzheimer's. In the first step for diagnosis, many questions are asked for a better understanding of health and daily life. Professional questions that are answered by the caretaker or nurse are as follows:

- I. General health.
- II. Current medicine or pharmacological treatments.
- III. Medical history.
- IV. Ability of doing daily activity.
- V. Changes in mood, behavior or personality.

Also, professional expert may do:

- I. Physical examination and neuropsychological evaluation.
- II. Examination of mental status including tests of memory, problem solving, basic mathematics, language.
- III. Standard medical examination including blood, urea to put away other possible symptoms.
- IV. Brain scanning including PET, MRI, CT to get certain diagnosis.

1.6 | Prevalence of Alzheimer in Different Countries

The epidemiology of the aging population all over the world is a phenomenon. In 1900, about 26 countries in the world had more than 2 million elderly people over 65 years old. It is estimated that in 2030, more than 34 countries will have an elderly population. In 2000, the elderly over 65 years old were 420 million people and it is predicted that with 7-12% increase, this population will reach 1 trillion people in 2030. In

developed countries, the number of elderly over 65 years old is more than in other countries and its reason is a reduction in birth and hope of life.

Prevalence of Alzheimer's is defined as cases in a specific population in a specific time range or occurrence is defined as new cases in a specific time range in the population who are under risk. Prevalence reflects health general burden of this disorder while occurrence reflects new cases of suffering people. Prevalence is characterized by two factors including the occurrence and duration of disorder. Most of the affected persons are living in developing countries. China and countries in the neighborhood of the west Pacific Ocean have a high frequency of Alzheimer and European countries, USA and India are in the following ratings. The increasing rate in India, China, and other countries in the south of Asia is about 300%. In European countries, 4/4% of people over 65 years old have Alzheimer's and Dementia. The rate of Alzheimer's increases with aging Only 1 in 1000 people reaches 90 years old.

Researchers showed that some races are susceptible to Alzheimer but it is not known if this is due to genetic factors. Alzheimer's among blacks and Spanish is more prevalent than among Americans. Other research suggested that Japanese who immigrate to Hawaii experience Alzheimer's more than Japanese who live in their countries. These studies are not certain and longitudinal and large-scale studies are needed.

The prevalence of Alzheimer's among women is 5 times of men and its reason is depression which increases the risk of Alzheimer's. The low prevalence of Alzheimer's in some countries may be due to testosterone and corticosterone and their effects on depression. In this line, androgens especially testosterone are anabolic hormones that stimulate protein formation that is related to memory and recognition ability so the reduction and elimination of testosterone may result in memory loss and lack of neuron-genesis and Alzheimer's.

2 | Discussion

2.1 | Advances in Prevention of Alzheimer's: Advantages and Disadvantages

People with Alzheimer's experience many problems in terms of behavior, function, and communication. It is necessary to train caretakers or nurses to improve the quality of life Acceptance of this disorder by others is very difficult, even the suffering have difficulty in acceptance that after raising children now themselves need help and support of children.

One of the main challenges is a negative attitude toward this disorder in persons and family members. Feeling shame is the main reason for not accepting this disorder. In addition to shame, tiredness is experienced by caretakers and nurses. So, it is recommended that caretakers be prepared to adjust themselves to conditions and risks that result from the progress of the disorder.

It is recommended that caretakers are allowed to talk about their problems during training and therapy courses to extinct their mental pressure. People in the course try to be aware of this disorder, to decrease their anxiety, and they gradually find out they are not alone as well as they are not the only ones who experience Alzheimer in beloved one. They will find out there are many caretakers who struggle with these conditions and they can share experiences to each others.

Alzheimer's association prepared many written guide booklets in which caretakers will be aware of conditions of any stages to behave appropriately to avoid tension and stress in themselves and the ill person. All families who struggle with Alzheimer's can use these guides and training.

Caretakers who are members of the Alzheimer's Association can participate in courses to use educational and psychological services. In addition, professionals with master's degrees and PHD present these services, and educational packages are free for ill persons and their caretakers.

All people need self-confidence and its enforcement for mental health. Therefore, to gain self-confidence, human beings need benefit from respect, social position, and good introspection, but important thing about

adults with Down syndrome is that they have no self-confidence due to feelings resulting from disabilities, failures, shame, deprivations, hopelessness, and humiliations. So, support more than usual may hinder their self-confidence so they cannot experience self-value and self-esteem by relying on their abilities.

Caretakers and teachers should enforce efficiency and usefulness to improve self-value and self-respect. Ignorance, threat, and inappropriate limitations for being active may be destructive to self-esteem and self-confidence. One simpler strategy is that ask their opinion on changing the decoration of a room or ask their opinion about routine activities including going to the park, theater, movies, trips, etc to prevent ignorance feeling. Feeling indifference and ignorance or severe pity and a very high level of support make them low self-value and lose self-esteem. They should be allowed to be independent in situations without any harm. Encouragement and enforcement verbally or non-verbally may increase their self-esteem.

Some people after middle age feel lonely due to cultural and social changes of immigration because they lost social connection and emotional interactions. The high level of prevalence of Alzheimer's among immigrants in Canada and European countries reflects this point because these persons have even limited motions and exercises.

An increasing number of preventive centers in Malaysia and, the establishment of friendly towns and universities for people with Alzheimer's in Scotland are the pioneers. In Scotland, all shops, cafes, and libraries have facilities for people with Alzheimer's. When there is a gathering place, all people are encouraged to learn about this disorder and will be active with high self-esteem to realize their potential live in communities with safety, and participate in social events. Also, establishing and increasing a number of research centers are necessary: for example teaching language centers or sports and exercise clubs or places for walking.

In many countries, police officers are trained to learn how to treat people with Alzheimer's to avoid tension. For example, they shouldn't use weapons for people with Alzheimer's. Police officers should talk to the lost person to see whether he/she has Alzheimer Disorder. Another point is the insurance of these people to use governmental subsidies for the facilitation of treatment without any extra costs. Also, family members of these people should have insurance to manage their lives without concerns.

About primary prevention, it can be said that primary prevention is possible when all functions are intact and the person has routine activities without any problem, so changing lifestyle and doing cognitive activities, having social and mental activities as well as physical activities may delay the onset of Alzheimer significantly or prevent its appearance. Therefore, primary prevention is considered when there are no significant problems. All developed countries spend 70% budget on medical and psychological services in the prevention of Alzheimer's because prevention is important.

About Secondary prevention of Alzheimer's. It can be said that when Alzheimer's occurs (in the early stage), secondary prevention will be possible. Because the acute stage does not appear. In terms of secondary prevention, given that there is a mild dysfunction we improve that function to prevent losing total function. When a function is lost totally, rehabilitation is not possible and is considered. We need a cue or a part of a function to improve it In the neurology field, a track of synapses should be there to force them to come back a function. When we talk about cognitive disorders in Alzheimer's, many of them appear in Alzheimer's. But, using alcohol and drugs may have effects on cognition so cognitive disorders are not identical to Alzheimer's.

Another point is about spiritual happiness, it means a life without stress and with comfort. Lifestyle, in fact, the van is involved in the prevention of Alzheimer's. When the mind and brain are in tension, neurotransmitters related to stress and anxiety are released so, the brain may lose its normal function and a problem will be raised. Spiritual happiness may create a state in which a person experiences joy and this joy is a positive emotion that is recorded in memory due to the fact that its emotional states are propagated so reviewing it in the brain may result in enjoyable feeling. When people review a joyful feeling in their mind, and when the brain makes this feeling a habit it will be a preventive variable for Alzheimer's.

In terms of cognitive disorders in children, it can be said that reduction in cognitive stimulation, the isolated child within four walls of a small apartment, lack of sensual and dynamic stimulation, and reduction of family interactions may be risk factors for Alzheimer's. Families with one child have limited interaction with other families. These points should be addressed since childhood rather than adulthood. Such cognitive stimulation should be done since birth and children should be under cognitive, social, sensual, and dynamic stimulations (exercises and various classes and different participations are necessary).

Regarding Alzheimer's in slow-paced adults with Down syndrome, it can be said that adults with Down syndrome become elderly at an early age due to biological exhaustion. Alzheimer's is more frequent among Down syndrome adults. In slow-paced adults with Down syndrome, CNS disorders particularly cognitive disorders are experienced at a high rate. Also, studies showed that people with Down syndrome will be affected by Alzheimer's at 35 years old. The causes of Alzheimer's among Down syndrome are not known. One of the factors is genetic (chromosome 21). Studies suggested that lack of estrogen may play a role in cognitive deficits in this population. Low level of estrogen particularly in women makes them susceptible to Alzheimer's. So this point should be considered in preventive strategies for Alzheimer's in Down syndrome.

Sensual disorders (losing auditory and visual ability) in Down syndrome have significant effects on learning and cognitive functions. When seizures occur during two critical periods (childhood and adult) it will disrupt normal neural development and in adult ages, it will result in a reduction of cognitive functions and Alzheimer's. So paying attention to care (pharmacological and nonpharmacological treatments) is necessary in order to prevent or reduce the frequency of seizures.

Another point is addressing sleep health. Those who sleep on time at night will be active in the morning. So good sleep pattern is necessary for the optimization of cognitive functions and frequency of Alzheimer's. Another important recommendation is the on-time treatment of other medical conditions including hypothyroid, congenital heart disease, and diabetes. Early intervention for these conditions may make cognitive and behavioral changes and consequently decrease the frequency of Alzheimer's.

What is the most important thing is paying attention to adult Down syndrome. According to studies, about 80% of an adult over 40 years old with Down syndrome may experience Alzheimer and the other remaining (20%) are those who have dynamic lives, happy family relationships, good social interaction, reading skills, and experience secure psychological attachment. The main feature of these people is having a good lifestyle (sleeping at night and being active in the morning) so that their muscular weakness will become better, their communication ability will be improved and importantly, they will have reading ability in return, they feel high self-esteem and self-value.

Followings are recommendation for prevention and reduction of prevalence of Alzheimer:

- I. Individuals with Down syndrome should be trained in reading skills (reading skill needs cooperation and visual perception, mental maintenance, decoding, and recalling) in other words, reading is a complex mental function that improves attention, concentration, and visual perception as well as recalling. In the reading process, there are some effective factors including attention, concentration, and motivation. But the biggest factor is perception. Perception ability will improve communication, they will read better and they will find a job successfully. Of course, according to our successful experiences in working with Slow Paced Students (SPS) so-called Intellectually disabled students, one of the most effective approaches in teaching reading skills to Slow passed children and adolescents with Down syndrome is Family Based on Conversational Reading (FBCR).
- II. Doing exercises and enforcement of physical and muscular strength so that exercise will improve spiritual happiness.
- III. Having healthy and good diet is important.
- IV. Arranging conversational family based conversational Reading training.
- V. Having kind, happy and intimate family relationships.

VI. Learning music, painting, and poem.

VII. Learning relationship between objects.

In summary, Alzheimer's is a risk factor for psychological and behavioral performances in people with Down syndrome so early diagnosis and intervention are necessary. (Establishment of preventive, diagnosis, and intervention centers are necessary for adult Down syndrome for reduction of frequency of Alzheimer's)

To answer the question "Is there a common cause for Alzheimer's and Down syndrome?" "is there common preventive strategies for Alzheimer's and Down syndrome?", studies suggest that the main root cause of Alzheimer's is a virus, bacterial inflammations, or microorganism of parasites like herpes complex. The cause of Down syndrome is trisomy 21 which is resulted from a microbe related to Alzheimer's. Getting an understanding of Alzheimer's and Down syndrome and these inflammations may add insight into the field of prevention of two diseases.

3 | Conclusion

Due to the increasing number of elderly people in the world, the rating of Alzheimer's is increasing. Prevention of Alzheimer's is the main key to managing the epidemiology of Alzheimer's. Only by delay in the onset of Alzheimer's, the social and economic burden will be decreased significantly. Interventions related to lifestyle may delay the onset of Alzheimer and many experts and professionals believe that there are many pieces of evidence that prevention and management of cardiovascular diseases, and modification of lifestyle including cigarette, hypertension, obesity, diabetes, and inactivity may prevent Alzheimer's significantly. Paying attention to diabetes, and obesity and the prevention of these factors is very important in the prevention of Alzheimer increasing. "What is good for the heart is good for the brain".

Although a plurality of neuronal populations is affected in Alzheimer's, degeneration of BFCNs is a consistent feature; the elucidation of BFCN pathogenesis may be generally instructive concerning the cellular mechanisms responsible for neurodegeneration. Additional studies-at the levels of molecules, cells, circuits, and behavior-will be needed to define precisely what role BFCNs play in cognitive function in normal subjects and in the dysfunction that characterizes Alzheimer's. An important aspect of this work will be a further elucidation of the role that NGF and other NTFs play. Current approaches to treatment with NGF are complicated by the difficulty of delivering the protein to the brain and by unwanted side effects. Recent progress in directly delivering NGF to the basal forebrain may obviate the latter, but the clinical resources required are considerable. Recent studies point to the possibility that BFCN axons are an early target of pathogenesis including the failure to properly transport neurotrophic signals. If confirmed and extended, the insights that follow would dramatically influence the understanding of pathogenesis and result in novel approaches for the treatment of this devastating disorder.

Evidence from FINGER research supports the effectiveness of this intervention approach and EDPI added insights in this field. These researches on preventive intervention identified response barriers. Multimodal preventive strategies related to lifestyle play an important role in decreasing Alzheimer's. Pharmacological interventions were tested on the last stage of Alzheimer's with poor findings. Current trials for persons under risk determine whether modification/corrective therapies are effective before the emergence of symptoms. If findings support this assumption it should be determined whether it is effective to apply a similar approach for all persons under risk in the general population.

About references: the present script used "family-based intervention for empowering of Down syndrome children written by Afrooz and Ghasemzade", "psychological basic of having child and the most favorite approach by Afrooz" and " psychology and rehabilitation of Down syndrome children by Afrooz" as references.

Author Contribution

Gholam ali afrooz: Conceptualized and designed the study, conducted the literature review, and wrote the initial draft of the manuscript.

Peyman rastgari: Analyzed data, contributed to manuscript revisions, and provided critical insights on Alzheimer's and Down syndrome and reviewed the manuscript for important intellectual content, ensured adherence to ethical guidelines, and approved the final version for submission.

Funding

No funding.

Data Availability

No data used in this research.

Conflicts of Interest

No conflicts.

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