# Knowledge About Alzheimer's Disease in Saudi Arabia

Fahi El-Gamal [1] , Ali K. Alali Sr. [2] , Muaadh H. Mashaabi [2] , Abdulhakim A. Alsaghah [2] , Faisal A. Shukr [2] , Syed Y. Kadri [2]

1. Family Medicine, Ibn Sina National College, Jeddah, SAU  2. Medical School, Ibn Sina National College, Jeddah, SAU

**Corresponding author:** Fahi El-Gamal, drfathimhelgamal1996@hotmail.com

## Abstract

### Background

Alzheimer's disease (AD) is the most common neurodegenerative dementia which constitutes a major healthcare problem globally. This study aimed to assess the pattern and determinants of knowledge about AD in Saudi Arabia.

### Methodology

In this cross-sectional study, information was collected from 286 participants using a validated questionnaire on seven subdomains of knowledge about AD. SPSS (IBM Corp., Armonk, NY, USA) was used for data analysis. Different tests of significance such as the chi-square test and principal component factor analyses were employed. The level of significance was set at 0.05.

### Results

The 25 questions on knowledge, attitudes, and practice about AD had a high Cronbach's alpha (0.911). All scores on the seven subdomains of knowledge, attitudes, and practice about AD were significantly correlated with each other ($p < 0.05$). The knowledge of the population about AD was very low, with the majority of the correct responses for questions on the different subdomains of knowledge about AD ranging from 10% to 67% (76% of the answers were below 50% correct answers). Females and smokers had higher scores on most subdomains compared to males and non-smokers ($p < 0.05$).

### Conclusions

Knowledge of the population about AD is very low. As the subdomains of knowledge on AD are correlated, healthcare professionals should implement health education programs on AD to increase the knowledge of the population regarding the course, symptoms, risk factors, treatment and management, and caregiving and reveal their association with the impact of AD on the health of affected individuals.

**Categories:** Family/General Practice, Neurology, Public Health
**Keywords:** saudi arabia, alzheimer's disease, early-onset alzheimer's disease, alzheimer care, alzheimer's dementia

## Introduction

Alzheimer's disease (AD), the most common neurodegenerative dementia, is characterized by the formation of amyloid plaques in the brain, loss of neuronal tissue, and the appearance of neurofibrillary tangles inside neurons, with subsequent brain atrophy, ongoing neurodegeneration, and cognitive impairment [1,2]. AD is significantly associated with increased age and family history and may occur due to traumatic brain damage [3-7].

Disorientation, cognitive decline, generalized confusion, and memory impairment are the main clinical symptoms of AD [8-10]. Individuals with AD may show warning symptoms such as sleep disturbance, mood changes, personality changes, and language difficulties [11,12]. AD occurs more commonly in the elderly [5]. Pathological lesions are usually preceded by oxidative stress [13,14]. AD is significantly more common in individuals whose jobs entail lower mental demands and higher physical demands [15,16]. Chronic diseases associated with the incidence and worsening of AD include diabetes mellitus, renal disease, cardiovascular disease, and high cholesterol [17]. Depression is also associated with the occurrence of AD, with both adversely affecting the quality of life of the patients [18]. Dementia is a prevailing neurodegenerative disease globally, with an incidence of 6.4% in Saudi Arabia [19]. Women after the ages of 80-85 years are at a greater risk of AD compared to men. This increased risk is related to the depletion of endogenous estrogen in the menopausal period [14]. Cigarette smoking increases the risk of AD [17,18]. This study aimed to explore the association of different sociodemographic characteristics with the knowledge about AD in a population from Saudi Arabia.

## Materials And Methods

This cross-sectional study employed a non-probability convenient sampling technique. Data were collected via online Google Forms distributed to individuals from Saudi Arabia. The sample size was determined using G*power software using an α of 0.05, power of 0.95, effect size of 0.3, and degree of freedom of 5. The minimal sample size required was 277. All 286 individuals who received the form, filled it, and sent it back were included in this study. For data collection, a predesigned questionnaire was used which included information on the sociodemographic and clinical characteristics of the participants. The validated Polish Alzheimer's Disease Knowledge Scale (ADKS) questionnaire was used [19] to describe seven subdomains, namely, risk factors; evaluation and diagnosis; symptoms; course; life effect, caregiving; and therapy and management of AD (Appendices). Each question was given three codes as follows: 3 for true, 2 for false, and 1 for do not know. The score for each domain was calculated using a simple additive method [20,21].

### Statistical analysis

Data were analyzed using the SPSS software (IBM Corp., Armonk, NY, USA). The chi-square test of significance, Student's t-test, and analysis of variance were used. The multifactorial principal component factor analysis was employed, and variables with weights of 0.5 or more were considered significantly associated with the factor. Only one factor proved to be significantly associated with most of the variables. The level of significance for the present study was set at 0.05.

### Ethical considerations

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Ibn Sina National College for Medical Studies (approval number: H-07-09062021; approval date: 09.06.2021).

## Results

The present study included 286 participants (53.1% males and 46.9% females) to assess the knowledge of the population about AD using the Polish ADKS questionnaire [19]. The 25 questions of ADKS about the seven domains on clinical aspects and management of AD used in the present study were highly reliable, with a Cronbach's alpha of 0.911. The percentage of correct answers is presented in Table 1. The majority of the correct responses for questions on the different subdomains were less than average. Responses are presented in Table 2.

| Variable | Category | Number frequency | Percentage |
|---|---|---|---|
| Gender | Male | 152 | 53.1 |
| | Female | 134 | 46.9 |
| | Total | 286 | 100.0 |
| Age (years) | Below 18 | 12 | 4.2 |
| | 18–25 | 89 | 31.1 |
| | 26–35 | 81 | 28.3 |
| | 36–45 | 52 | 18.2 |
| | Above 45 | 52 | 18.2 |
| | Total | 286 | 100.0 |
| Nationality | Saudi | 247 | 86.4 |
| | Non-Saudi | 39 | 13.6 |
| | Total | 286 | 100.0 |
| Family history of Alzheimer's disease | No | 239 | 83.6 |
| | Parent | 11 | 3.8 |
| | Grandparents | 36 | 12.6 |
| | Total | 286 | 100.0 |
| Occupation | Unemployed | 150 | 52.4 |
| | Manual worker | 61 | 21.3 |
| | Clerical worker | 75 | 26.2 |
| | Total | 286 | 100.0 |
| Educational level | High school | 64 | 22.4 |
| | Diploma | 43 | 15.0 |
| | University | 162 | 56.6 |
| | Higher educational level | 17 | 5.9 |
| | Total | 286 | 100.0 |
| Smoking habit | Non-smoker | 221 | 77.3 |
| | Smoker | 52 | 18.2 |
| | Ex-smoker | 13 | 4.5 |
| | Total | 286 | 100.0 |

**TABLE 1: Frequencies of variables.**

| Question for each subdomain | Correct answers (%) |
|---|---|
| Life impact | |
| People with AD are particularly prone to depression | 41.3% |
| Most people with AD live in nursing homes | 10.8% |
| It is safe for people with AD to drive as long as they have a companion in the car at all times | 23.1% |
| Risk factors | |
| It has been scientifically proven that mental exercises can prevent a person from getting AD | 40.2% |
| People in their 30s can have AD | 43.4% |
| Having high cholesterol may increase a person's risk of developing AD | 65.4% |
| Prescription drugs that prevent AD are available | 52.4% |
| Having high blood pressure may increase a person's risk of developing AD | 56.6% |
| Genes can only partially account for the development of AD | 39.5% |
| Course | |
| In rare cases, people have recovered from AD | 36.4% |
| Eventually, a person with AD will need 24-hour supervision | 17.1% |
| Assessment and diagnosis | |
| If trouble with memory and confused thinking appears suddenly, it is likely due to AD | 26.2% |
| When a person with AD becomes agitated, a medical examination might reveal other health problems that caused the agitation | 54.9% |
| Symptoms of severe depression can be mistaken for symptoms of AD | 36.4% |
| AD is one type of dementia | 20.3% |
| Treatment and management | |
| Poor nutrition can make the symptoms of AD worse | 68.9% |
| AD cannot be cured | 43.0% |
| Symptoms | |
| Tremor or shaking of the hands or arms is a common symptom in people with AD | 43.0% |
| Trouble handling money or paying bills is a common early symptom of AD | 31.8% |
| A symptom that can occur with AD is believing that other people are stealing one's things | 42.3% |
| Most people with AD remember recent events better than things that happened in the past | 35.0% |
| Caregiving | |
| When people with AD repeat the same question or story several times, it is helpful to remind them that they are repeating themselves | 20.6% |
| Once people have AD, they are no longer capable of making informed decisions about their own care | 28.3% |
| When a person has AD, using reminder notes is a crutch that can contribute to the decline | 37.4% |
| People with AD do best with simple instructions given one step at a time | 51.0% |

**TABLE 2: Distribution of the participants according to the correct answers to the questions on the different domains of Alzheimer's disease (AD).**

The maximum score for each subdomain and the mean score for the different categories of the sociodemographic variables are displayed in Table *3* and Table *4*. Slight variations in the mean scores of the

different categories of the sociodemographic variables were noticed. In general, the mean scores for the knowledge of the population on the subdomains of AD were substandard.

| Variables | | Risk factor | | Domain symptoms | | Domain course | |
|---|---|---|---|---|---|---|---|
| | | Maximum score = 18 | | Maximum score = 12 | | Maximum score = 6 | |
| | Categories | P | Mean | P | Mean | P | Mean |
| Age (years) | Below 18 | 0.922 | 14.7 | 0.373 | 10 | 0.358 | 4.8 |
| | 18–25 | | 14.6 | | 9.2 | | 4.6 |
| | 26–35 | | 14.7 | | 9.5 | | 4.7 |
| | 36–45 | | 14.4 | | 9.4 | | 4.5 |
| | Above 45 | | 14.7 | | 9.3 | | 4.7 |
| Education level | High school | 0.010 | 15.1 | 0.075 | 9.7 | 0.270 | 4.7 |
| | Diploma | | 15.0 | | 9.5 | | 4.8 |
| | University | | 14.3 | | 9.2 | | 4.6 |
| | Higher | | 14.2 | | 9.1 | | 4.6 |
| Family history | No | 0.350 | 14.6 | 0.057 | 9.4 | 0.045 | 4.6 |
| | Parent | | 13.9 | | 8.5 | | 4.1 |
| | Grandparents | | 14.8 | | 9.5 | | 4.6 |
| Occupation | Unemployed | 0.051 | 14.4 | 0.130 | 9.3 | 0.127 | 4.5 |
| | Manual worker | | 15.1 | | 9.7 | | 4.8 |
| | Clerical worker | | 14.5 | | 9.3 | | 4.7 |
| Nationality | Saudi | 0.566 | 14.6 | 0.403 | 9.3 | 0.518 | 4.6 |
| | Non-Saudi | | 14.3 | | 9.5 | | 4.7 |
| Gender | Male | 0.018 | 14.6 | 0.140 | 9.3 | 0.031 | 4.6 |
| | Female | | 14.5 | | 9.3 | | 4.6 |
| Smoking | Non-smoker | 0.291 | 14.4 | 0.504 | 9.3 | 0.673 | 4.6 |
| | Smoker | | 14.6 | | 9.3 | | 4.7 |
| | Ex-smoker | | 15.8 | | 10.2 | | 5.0 |

**TABLE 3: Distribution of the participants according to sociodemographic characteristics and Alzheimer's disease-related domain scores.**

| Variables | | Life impact | | Caregiving | | Assessment and diagnosis | | Treatment and management | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | Maximum score = 12 | | Maximum score = 6 | | Maximum score = 12 | | Maximum score = 9 | |
| | Categories | P | Mean | P | Mean | P | Mean | P | Mean |
| Age (years) | Below 18 | 0.515 | 9.7 | 0.819 | 4.3 | 0.698 | 10 | 0.174 | 7 |
| | 18–25 | | 9.5 | | 4.3 | | 9.6 | | 7 |
| | 26–35 | | 9.7 | | 4.3 | | 9.7 | | 7.4 |
| | 36–45 | | 9.3 | | 4.2 | | 9.8 | | 7.1 |
| | Above 45 | | 9.6 | | 4.2 | | 9.8 | | 7.2 |
| Education level | High school | 0.029 | 9.8 | 0.141 | 4.4 | 0.252 | 9.9 | 0.362 | 7.2 |
| | Diploma | | 9.7 | | 4.4 | | 9.8 | | 7.4 |
| | University | | 9.3 | | 4.2 | | 9.6 | | 7.1 |
| | Higher | | 9.7 | | 4.3 | | 9.7 | | 7.5 |
| Family history | No | 0.067 | 9.5 | 0.215 | 4.3 | 0.572 | 9.7 | 0.528 | 7.2 |
| | Parent | | 8.6 | | 4 | | 9.3 | | 7.2 |
| | Grandparents | | 9.6 | | 4.5 | | 9.7 | | 7.4 |
| Type of work | No | 0.137 | 9.4 | 0.278 | 4.2 | 0.000 | 9.6 | 0.065 | 7.1 |
| | Manual worker | | 9.8 | | 4.4 | | 10.3 | | 7.5 |
| | Clerical worker | | 9.5 | | 4.3 | | 9.4 | | 7.9 |
| Nationality | Saudi | 0.484 | 9.5 | 0.968 | 4.3 | 0.339 | 9.7 | 0.868 | 7.2 |
| | Non-Saudi | | 9.4 | | 4.3 | | 9.9 | | 7.2 |
| Gender | Male | 0.034 | 9.7 | 0.000 | 4.3 | 0.029 | 9.6 | 0.041 | 7.2 |
| | Female | | 9.4 | | 4.1 | | 9.8 | | 7.2 |
| Smoking | Non-smoker | 0.756 | 9.4 | 0.000 | 4.2 | 0.047 | 9.6 | 0.474 | 7.2 |
| | Smoker | | 9.6 | | 4.4 | | 9.8 | | 7.2 |

**TABLE 4: Distribution of participants according to sociodemographic characteristics and Alzheimer's disease-related domains.**

The Pearson correlation coefficients for the scores on the seven subdomains of AD are presented in Table 5. High correlation coefficients were observed between the different scores, and these strong positive associations between the seven subdomains were also confirmed by the factor analysis where weights of the variables for the subdomains were significantly loaded on the same factor (factor 1) (Table 6).

| Subdomains | | Risk factors | Symptoms | Course | Treatment and management | Assessment and diagnosis | Caregiving | Life impact |
|---|---|---|---|---|---|---|---|---|
| Risk factors | r | 1 | | | | | | |
| Symptoms | r | 0.687*** | 1 | | | | | |
| Course | r | 0.537*** | 0.563*** | 1 | | | | |
| Treatment and management | r | 0.599*** | 0.490*** | 0.441*** | 1 - | | | |
| Assessment and diagnosis | r | 0.642*** | 0.674*** | 0.497*** | 0.476*** | 1 | | |
| Caregiving | r | 0.468*** | 0.567*** | 0.492*** | 0.372*** | 0.522*** | 1 | |
| Life impact | r | 0.696*** | 0.675*** | 0.545*** | 0.509*** | 0.585*** | 0.534*** | 1 |

**TABLE 5: Correlation between all Alzheimer's disease domains.**

*: $P < 0.05$; **: $P < 0.01$; ***: $P < 0.001$.

| Variables | Weight of variables on Factor 1 |
|---|---|
| People with AD are particularly prone to depression | 0.502 |
| It has been scientifically proven that mental exercises can prevent a person from getting AD | 0.127 |
| When a person with AD becomes agitated, a medical examination might reveal other health problems that caused the agitation | 0.224 |
| People with AD do best with simple instructions given one step at a time | 0.530 |
| In rare cases, people have recovered from AD | 0.552 |
| If trouble with memory and confused thinking appear suddenly, it is likely due to AD | 0.652 |
| Most people with AD live in nursing homes | 0.588 |
| Poor nutrition can make the symptoms of AD worse | 0.516 |
| People in their 30s can have AD | 0.108 |
| When people with AD repeat the same question or story several times, it is helpful to remind them that they are repeating themselves | 0.662 |
| Once people have AD, they are no longer capable of making informed decisions about their own care | 0.635 |
| Eventually, a person with AD will need 24-hour supervision | 0.622 |
| Having high cholesterol may increase a person's risk of developing AD | 0.520 |
| Tremor or shaking of the hands or arms is a common symptom in people with AD | 0.597 |
| Symptoms of severe depression can be mistaken for symptoms of AD | 0.654 |
| AD is one type of dementia | 0.531 |
| Trouble handling money or paying bills is a common early symptom of AD | 0.695 |
| A symptom of AD is believing that other people are stealing one's things | 0.627 |
| When a person has AD, using reminder notes is a crutch that can contribute to the decline | 0.558 |
| Prescription drugs that prevent AD are available | 0.534 |
| Having high blood pressure may increase a person's risk of developing AD | 0.558 |
| Genes can only partially account for the development of AD | 0.612 |
| It is safe for people with AD to drive, as long as they have a companion in the car at all times | 0.602 |
| AD cannot be cured | 0.604 |
| Most people with AD remember recent events better than things that happened in the past | 0.535 |

**TABLE 6: Principal component factor analysis for the knowledge, attitudes, and practice of the population toward Alzheimer's disease (AD).**

## Discussion

This research is among the first investigations of the population's knowledge in Saudi Arabia regarding AD based on the Polish ADKS. This study confirmed the findings of previous studies on the validity and reliability of this questionnaire [19-21]. In the present study, all questions of the questionnaire were significantly associated, as proven by the factor analysis and Cronbach's alpha of 0.911. Significant associations between the seven subdomains were found in this study. Life impact was found to be associated with caregiving, symptoms, and treatment. Moreover, risk factors, assessment and diagnosis, caregiving, and management and treatment were found to be associated with the course of AD. As the intervention for AD is multidisciplinary, it is worth noting that the well-being of the patient is directly influenced by these factors [22]. Increased educational levels had lower scores on the subdomains of risk factors and life impact. This is contradictory to the findings of other studies [23-25]. Female participants had less retention of knowledge on life impact, caregiving, treatment and management, risk factors, and course than males. On

the other hand, males had higher scores on the subdomains of assessment and diagnosis. This is not in line with other studies [26,27]. Previous studies found that advancing age and postgraduate training were significantly associated with better information on knowledge about AD [26,28]. However, in this study, we did not find such an association. Meanwhile, it was shown in the present study that higher knowledge on the course subdomain was associated with having relatives diagnosed with AD, which could be related to gaining knowledge through their experience with their affected relatives. Previous studies found similar associations [5,18]. The factor analysis employed in this study revealed that all elements of the seven subdomains of knowledge score about AD were significantly related; thus, identifying the knowledge gap is crucial to bridge the gap in knowledge of the public about AD. Symptoms were found to be associated with treatment and management. As AD is managed by multiple specialties, integration of these subdomains is essential for the well-being of the patient [29]. Lack of knowledge on caregiving may to some extent delay the management and interventions provided to patients diagnosed with AD and lead to adverse effects on their quality of life [30].

### Limitations

There are some limitations of this study. As this study was cross-sectional, and the sampling technique was a non-probability convenient one, its generalization to the population may be limited; however, this study was an exploratory investigation.

## Conclusions

In this study, the majority of studied participants had a lower level of knowledge on all domains of knowledge about AD. All subdomains of knowledge about AD were significantly correlated and potentiated each other. Upgrading the knowledge of the public about these subdomains will improve the management of AD, with subsequent improvement in the quality of life of affected individuals. Thus, national awareness campaigns for all parts of the community are essential to enhance awareness about AD.

## Appendices

| | | | |
|---|---|---|---|
| 1 | People with Alzheimer's disease are particularly prone to depression | True | False |
| 2 | It has been scientifically proven that mental exercise can prevent a person from getting Alzheimer's disease | True | False |
| 3 | After symptoms of Alzheimer's disease appear, the average life expectancy is 6 to 12 years | True | False |
| 4 | When a person with Alzheimer's disease becomes agitated, a medical examination might reveal other health problems that caused the agitation | True | False |
| 5 | People with Alzheimer's disease do best with simple, instructions given one step at a time. | True | False |
| 6 | When people with Alzheimer's disease begin to have difficulty taking care of themselves, caregivers should take over right away | True | False |
| 7 | If a person with Alzheimer's disease becomes alert and agitated at night, a good strategy is to try to make sure that the person gets plenty of physical activity during the day. | True | False |
| 8 | In rare cases, people have recovered from Alzheimer's disease | True | False |
| 9 | People whose Alzheimer's disease is not yet severe can benefit from psychotherapy for depression and anxiety | True | False |
| 10 | If trouble with memory and confused thinking appears suddenly, it is likely due to Alzheimer's disease | True | False |
| 11 | Most people with Alzheimer's disease live in nursing homes | True | False |
| 12 | Poor nutrition can make the symptoms of Alzheimer's disease worse | True | False |
| 13 | People in their 30s can have Alzheimer's disease | True | False |
| 14 | A person with Alzheimer's disease becomes increasingly likely to fall as the disease gets worse | True | False |
| 15 | When people with Alzheimer's disease repeat the same question or story several times, it is helpful to remind them that they are repeating themselves | True | False |
| 16 | Once people have Alzheimer's disease, they are no longer capable of making informed decisions about their own care | True | False |
| 17 | Eventually, a person with Alzheimer's disease will need 24-hour supervision | True | False |
| 18 | Having high cholesterol may increase a person's risk of developing Alzheimer's disease | True | False |
| 19 | Tremor or shaking of the hands or arms is a common symptom in people with Alzheimer's disease | True | False |
| 20 | Symptoms of severe depression can be mistaken for symptoms of Alzheimer's disease | True | False |
| 21 | Alzheimer's disease is one type of dementia | True | False |
| 22 | Trouble handling money or paying bills is a common early symptom of Alzheimer's disease | True | False |
| 23 | One symptom that can occur with Alzheimer's disease is believing that other people are stealing one's things | True | False |
| 24 | When a person has Alzheimer's disease using reminder notes is a crutch that can contribute to the decline | True | False |
| 25 | Prescription drugs that prevent Alzheimer's disease are available | True | False |
| 26 | Having high blood pressure may increase a person's risk of developing Alzheimer's disease | True | False |
| 27 | Genes can only partially account for the development of Alzheimer's disease | True | False |
| 28 | It is safe for people with Alzheimer's disease to drive, as long as they have a companion in the car at all times | True | False |
| 29 | Alzheimer's disease cannot be cured | True | False |
| 30 | Most people with Alzheimer's disease remember recent events better than things that happened in the past. | True | False |

**TABLE 7: Questionnaire items.**

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Ali K. Alali Sr., Fahi El-Gamal, Muaadh H. Mashaabi, Abdulhakim A. Alsaghah, Faisal A. Shukr, Syed Y. Kadri

**Acquisition, analysis, or interpretation of data:** Ali K. Alali Sr., Fahi El-Gamal, Muaadh H. Mashaabi, Abdulhakim A. Alsaghah, Faisal A. Shukr, Syed Y. Kadri

**Drafting of the manuscript:** Ali K. Alali Sr., Fahi El-Gamal, Muaadh H. Mashaabi, Abdulhakim A. Alsaghah, Faisal A. Shukr, Syed Y. Kadri

**Critical review of the manuscript for important intellectual content:** Ali K. Alali Sr., Fahi El-Gamal, Muaadh H. Mashaabi, Abdulhakim A. Alsaghah, Faisal A. Shukr, Syed Y. Kadri

## Disclosures

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