

Extent of and influences on knowledge of Alzheimer's disease among undergraduate medical students

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ABSTRACT

Background: Alzheimer's disease (AD) is a major health problem, which is of increasing concern because of rising yearly incidence and estimated cost. Early diagnosis and treatment is essential to manage AD effectively and improve the outcomes. Inadequate knowledge can delay the diagnosis. General practitioners should play a more effective role in the identification and diagnosis of AD, and medical education is key to solving this issue. **Objectives:** This study aimed to assess the knowledge of undergraduate medical students and to identify the factors that influenced their knowledge. **Methods:** This study used a quantitative cross-sectional evaluation of 327 Saudi Arabian medical students from the first and final years in Riyadh, Saudi Arabia, who participated in an online survey via email between March and May 2018. Knowledge of AD was assessed using the 12-item AD Knowledge Test for Health Professionals from the University of Alabama at Birmingham (UAB ADKT). General linear models were used to identify the most significant influence on AD knowledge scores. **Results:** Only 10.73% of first-year and 33.33% of final-year students scored $\geq 50\%$ on the UAB ADKT. Students pursuing specialties related to AD (adult neurology, geriatrics, or psychiatry) and students aged ≥ 27 years had higher scores ($P < 0.05$). **Conclusion:** Undergraduate medical students lacked proper knowledge of AD, suggesting that improvements in education programs can help. Future studies are needed to assess the quality and effectiveness of AD education in the curriculum of Saudi medical schools.

Keywords: Alzheimer's disease, educational evaluation, medical education, medical students, physician training

Introduction

Alzheimer's disease (AD) is a rising health problem, with an estimated 5.7 million affected in the United States (US) in 2018.^[1] By 2050, that number is projected to reach to 16 million.^[2]

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The global estimates of expenses associated with AD reached \$957.56 billion in 2015.^[3] Early diagnosis and effective treatment is required to enable patients and their caregivers to achieve optimal management of AD and thereby decrease health-care costs.^[4] General practitioners (GPs) can play an essential role in identifying and diagnosing AD by employing a number of tests of cognitive function.^[5,6] Physicians of all specialties ostensibly have the knowledge and skills to diagnose, communicate, and care for patients throughout all stages of the disease. However, the extant literature finds a lack of adherence to the management and diagnosis guidelines for AD.^[7-9]

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One of the main causes for suboptimal AD care is the inadequacy of knowledge about AD diagnosis and management.^[10-14] Therefore, two-thirds of all dementia and more than 90% of early dementia is missed by the primary-care physicians.^[15] The AD Knowledge Test from the University of Alabama at Birmingham (UAB ADKT) is designed to assess knowledge about AD clinical diagnosis, treatment, and management among health professionals.^[16] It has been used to illustrate a significant difference between GPs and AD specialists.^[5,16] The absence of knowledge can postpone the diagnosis, thus deferring treatment and management and ultimately lessening the time available for the patient and relatives to address legitimate issues.

Healthy People 2020 introduced a new objective: To increase the appropriate diagnosis of AD cases.^[17] Improving knowledge is considered as one solution for achieving this objective. To our knowledge, there is limited contemporary information about the adequacy of, and factors that affect, knowledge of AD diagnosis, treatment, and management among undergraduate medical students in the Middle Eastern region that includes Saudi Arabia. This study aimed to assess the knowledge gap, and factors that affect it, among future physicians during their undergraduate medical education.

Materials and Methods

Study design and subjects

This was a quantitative cross-sectional survey-based study conducted from March to May 2018 in Riyadh, the capital and largest city in Saudi Arabia. It utilized the UAB ADKT validated scale with permission from Barrett *et al.*^[16] to assess knowledge related to AD among first-year and final-year medical students. Medical schools selected for enrolment in this study were composed of Saudi Arabian governmental medical schools in Riyadh city, which taught both males and females and had students in their first and final years during the 2017–2018 academic year. A total of three schools met the inclusion criteria, and all three agreed to participate in this study.

From each medical school, a batch leader provided a list of contact information for first-year and final-year students. The online questionnaire, along with the purpose and significance of the study, was sent to a total of 450 medical students. A reminder e-mail was sent to the students 1 week after the first e-mail. Every response was associated with a reciprocal IP address to prevent multiple responses from the same participant.

This study protocol was approved by the Institutional Review Board of Al-Imam Muhammad Ibn Saud Islamic University, and informed consent was obtained through a formal online web page from each participant before they completed the questionnaire. Students' scores were collected anonymously. The participants were allowed to answer voluntarily at their convenient time and not required to participate during class time.

Questionnaire

After the informed consent, participants took the online survey, which started with general questions about demographics (age and gender), level of study (first or final year), name of university, intended specialty, previous experience (personal, volunteering, and/or work experience), number of neurology courses taken, and the year of these courses. The survey concluded with the UAB ADKT.

Table 1 shows the contents of the UAB ADKT, which contains 12 multiple choice questions that cover five domains: terminology, assessment, patient management, clinical course, and legal subjects.^[16] Mean scores have been established within various medical populations: 4.76 ± 1.86 for undergraduate nursing students, 8.49 ± 2.20 for GPs and 10.75 ± 1.34 for physicians of specialties.^[16]

Statistical analysis

Descriptive statistics were employed to measure the significance of UAB ADKT score differences among different demographics. The Fisher exact test was used to compare the scores of first-year versus final-year students. A multivariate general linear regression model was used to study factors affecting the scores of final-year students. The model analyzed how the score was affected by combinations of advanced age (≥ 27 years), gender, intended specialty (dichotomized as adult neurology, geriatrics, or psychiatry vs. any other), number of neurology courses taken, and type of previous experience with AD. *P* values ≤ 0.05 were considered significant. Data were collected and tabulated using Microsoft Excel 2016 and analyzed with the SPSS software (Version 25, IBM Corp., Armonk, NY, USA).

Results

Of the 450 questionnaires sent, a total of 327 medical students completed it (response rate = 72.7%). Table 2 contains the demographics of the participants. First-year students accounted for 54.1% ($n = 177$) of the total sample while final-year students comprised the remaining 45.9% ($n = 150$). A percentage of 36.9 ($n = 65$) of first-year students and 46.6% ($n = 70$) of final-year students had some sort of previous experience with AD.

The mean knowledge score was 4.33 (SD = 1.697) for first-year students and 5.62 (SD = 1.938) for final-year students. Only 10.73% ($n = 19$) of first-year students and 33.33% ($n = 50$) of final-year students answered six or more questions correctly. The proportion of correct responses for each item is summarized graphically in Figure 1. Final-year students scored significantly better than first-year students on questions 1, 2, 3, 4, and 7 but scored significantly worse on question 11. On questions 5, 6, 8, 9, 10, and 12, there was no significant difference between students in the first and final years.

In the general linear model, only advanced age (≥ 27 years) and dichotomized intended specialty (adult neurology, geriatrics,

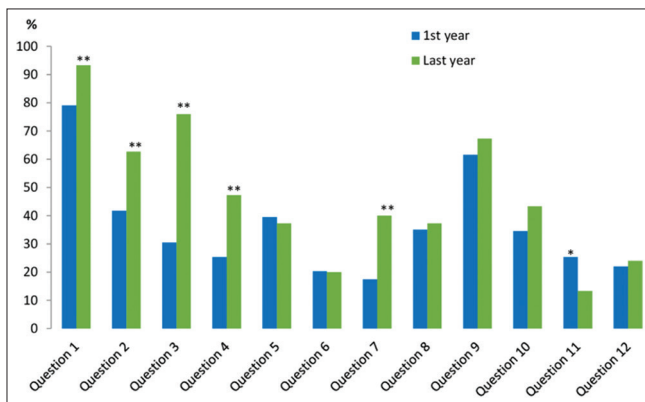
Table 1: University of Alabama at Birmingham Alzheimer's Disease Knowledge Test for Health Professionals (UAB ADKT). The 12 multiple-choice items were adapted with permission from Barrett *et al.* (1997)

Test items

- One of the risk factors of Alzheimer's disease is:
 Hardening of the arteries
 Age (true)
 Nutritional deficits
 Exposure to aluminum
- All of the followings are potentially treatable etiologies of dementia except:
 Pick's disease (true)
 Pernicious anemia
 Subdural hematoma
 Normal pressure hydrocephalus
- When a patient develops a sudden onset of confusion, disorientation, and inability to sustain attention, this presentation is most consistent with the diagnosis of:
 Alzheimer's
 Delirium (true)
 Major depression
 Pick's
- Which of the following tests is not a necessary part of the initial evaluation of a patient with possible Alzheimer's disease?
 Thyroid function tests
 Serum electrolytes
 Vitamin B and folate levels
 Protein electrophoresis (true)
- Which of the following cognitive deficits is most likely to occur first during the progression of Alzheimer's disease?
 Inability to recognize family members
 Disorientation to date (true)
 Inability to name common objects, such as a watch or a pen
 Disorientation to place
- Which of the following procedures is required to make a definitive diagnosis of Alzheimer's disease?
 MRI
 Mini-Mental State Exam
 Microscopic examination of CNS tissue (true)
 CAT scan
- According to the National Institute of Neurological and Communicative Disorders and Stroke, and the Alzheimer's Association, the criteria for the clinical diagnosis of probable Alzheimer's disease include all of the followings except:
 Focal neurological findings (true)
 Onset as early as 40 years old, most often after age 65
 Deficits in two or more areas of cognition
 No disturbance of consciousness
- Which of the following clinical findings best differentiates vascular dementia from AD?
 Word finding problems
 Short-term (2-min span) visual memory loss
 Stepwise disease course (true)
 Presence of depression
- Which of the following is the most common cause of severe memory loss in people over age 65?
 Alzheimer's disease (true)
 Senility
 Normal aging
 Hardening of arteries
- Which of the following statements is true concerning the use of physical restraints with patients with Alzheimer's disease?
 Restraints can contribute to the development of physical health problems (true)
 Restraints are usually necessary for patient safety
 Restraints reassure patients by establishing limits
 Restraints tend to calm agitated patients
- To be legally binding, an Alzheimer's disease patient's informed consent must be:
 Voluntary, competent, and witnessed by a physician
 Voluntary and informed
 Voluntary, informed, and competent (true)
 Voluntary, informed, and witnessed by a physician
- When someone with Alzheimer's disease begins to have frequent lip-smacking movements, one should suspect an adverse reaction from a (an):
 Barbiturate
 Phenothiazine (true)
 Benzodiazepine
 Anticholinergic drug

Table 2: Demographics of 327 medical student participants, from three medical schools in Riyadh, Saudi Arabia, who agreed to participate in the email survey version of the University of Alabama at Birmingham Alzheimer's Disease Knowledge Test for Health Professionals

Character variable	Value	First year (%)	Final year (%)	P
Age	18-20 years	116 (65.5%)	2 (1.3%)	<0.001
	21-23 years	54 (30.5%)	46 (30.7%)	
	24-26 years	5 (2.8%)	94 (62.7%)	
	>=27 years	1 (1.1%)	8 (5.3%)	
Gender	Female	94 (53.1%)	47 (31.3%)	<0.001
	Male	83 (46.9%)	103 (68.7%)	
Intended specialty	Psychiatry	6 (3.4%)	12 (8.0%)	0.013
	Geriatrics	1 (0.6%)	2 (1.3%)	
	Adult generalist	4 (2.3%)	13 (8.7%)	
	Adult neurology	6 (3.4%)	8 (5.3%)	
	Other	18 (10.2%)	39 (26)	
	Don't know/No specialty	142 (80.1%)	76 (50.7%)	
Neurology courses taken	Non	153 (86.4%)	19 (12.7%)	<0.001
	One	15 (8.5%)	19 (12.7%)	
	Two	4 (2.3%)	90 (60.0%)	
	Three	0 (0.0%)	18 (12.0%)	
	More than three	5 (2.8%)	4 (2.7%)	
Type of experiences with AD	None	118 (63.1%)	87 (53.4%)	0.021
	Personal	41 (21.9%)	38 (23.3%)	
	Volunteer	21 (11.2%)	18 (11.0%)	
	Work experience	7 (3.7%)	20 (12.3%)	

**Figure 1:** Comparison of the proportion of students who answered each test item correctly in the first year versus the final year. The UAB ADKT was taken via email survey by 327 medical students

or psychiatry vs. any other) influenced the AD knowledge score (predicting a covariate-adjusted 0.33 and 0.16 points higher, respectively; $F(3, 159) = 11.514, P < 0.05$).

Discussion

The aim of this study was to assess the knowledge of AD among first- and final-year medical students and to identify factors that influenced this knowledge. It was found that first-year students scored poorly on the UAB ADKT, with only 10.73% answering $\geq 50\%$ of the questions correctly. Final-year students scored better, with one-third (33.33%) scoring $\geq 50\%$. Beyond year in school, scores were influenced significantly by age and intended specialty; students aged ≥ 27 years and students who

intended to pursue adult neurology, geriatrics, or psychiatry scored better on the UAB ADKT. Nagle *et al.*^[18] used the UAB ADKT to assess AD knowledge among 343 undergraduate US medical students in the first and final years, and those students scored better than in the present study, as 68% of final-year US students scored 10 or more of the questions correctly.

The findings of our study suggest a need for improvement in the didactics and training of undergraduate medical students in Saudi Arabia, particularly as AD is becoming a major burden and rising health problem. Desai *et al.*^[19] found a dramatic improvement in AD knowledge, from 57% to 71%, after implementing a sensitization program with regular patient interactions for medical students in their final year. In addition, the implementation of geriatric and AD-specific courses and clerkships can increase medical students' confidence in assessing and diagnosing patients with AD.^[20,21] Furthermore, in this study, those who were interested in AD-related specialties were significantly more likely to have accurate knowledge. This aligns with a prior finding that an interest in a topic is predictive of more pertinent reading in young people,^[22] so there is a chance that AD knowledge will be improved by increasing the required reading on the topic. These and other efforts for improving the training of future primary-care physicians may aid in this lacuna.

It is crucial that future physicians who will work as GPs or in various specialties are educated and trained thoroughly in AD, particularly in light of the rising incidence of AD around the world. The addition and increase in quantity of teaching hours

on this topic must be encouraged and must cover all aspects of AD, including terminology, assessment, clinical course, patient management, and legal issues.

The limitations of this study include the self-reported nature of the data, which holds the potential for misclassification. Moreover, this study was conducted only in Riyadh city, the capital and largest city in Saudi Arabia, but it may have poor generalizability to schools in different regions that use a distinct curriculum for undergraduate medical education. Lastly, the 12-question knowledge test cannot fully capture the knowledge and skills required to diagnose, assess, and manage AD appropriately. A more comprehensive examination might disclose additional relevant deficiencies among medical students and providers.

Conclusions

This study filled a gap in the literature by evaluating the knowledge of AD among medical students in their undergraduate education years in Riyadh, Saudi Arabia, and found a problematic lack of accurate knowledge. Additionally, interest in an AD-related speciality significantly predicted better knowledge, so further reading on AD may help all students obtain the necessary understanding. Further studies are needed to assess the quality and effectiveness of AD education in the curriculum of medical schools in Saudi Arabia.

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Conflicts of interest

There are no conflicts of interest.

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