

# Knowledge and Attitudes of Undergraduate Dental, Allied Oral Health and Nursing Students Towards Patients with Alzheimer's Disease

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## ABSTRACT

**Purpose** Alzheimer's disease (AD) is an age-related illness that is becoming increasingly more prevalent in the United States. The purpose of this pilot study was to assess dental, allied oral health, and nursing students' perceived knowledge, comfort, and attitudes for individuals with AD.

**Methods** A total of 851 students from a university dental and nursing school were invited to participate in this cross-sectional study. A 48-item survey comprising of demographic questions, the Alzheimer's Disease Knowledge Scale (ADKS) and the Dementia Attitudes Scale (DAS) was disseminated via an electronic survey platform. Responses were summarized as means and standard deviations or counts and rates. Comparisons of survey responses by program type and exposure to AD, age group, and prior degree were performed using the chi-square test for association and analysis of variance.

**Results** The response rate was 33.2%. Nursing students demonstrated the highest level of knowledge on AD with mean score of 25.26 (SD 2.87), followed by dental (M=23.4, SD 3.26) and allied oral health students (M=22.10, SD 2.98). Overall, students demonstrated perceived comfort in treating patients with AD and related dementias with mean scores in the "slightly agree" range. Nursing students demonstrated the highest level of perceived comfort (M=5.61, SD 0.71).

**Conclusions** Nursing students demonstrated higher knowledge and more positive attitudes toward AD than dental and allied oral health students. There is a need for improved educational training and an expanded didactic curriculum to enhance knowledge for dental and allied oral health students. This pilot study provides a blueprint for replication on a national level

**Keywords** Alzheimer's disease, geriatric dentistry, dementia, attitudes, health professional students

NDHRA priority area, **Professional development: Education**(evaluation).

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## INTRODUCTION

Alzheimer's disease is an age-related illness that is becoming increasingly more prevalent, with approximately 5.8 million Americans over the age of 65 living with the disease.<sup>1</sup> It is projected that 13.8 million individuals will have Alzheimer's disease by 2050.<sup>2</sup> The nature of Alzheimer's disease is complex, multifaceted, and relatively foreign to researchers.<sup>3-5</sup> Alzheimer's disease can be described as a degenerative disease of the brain in which the neurons involved in cognitive function are damaged.<sup>1,3-5</sup> Eventually, the extent of neural damage becomes so significant that it renders the individual unable to perform essential bodily functions and ultimately leads to death.<sup>1,3-5</sup> The Alzheimer's disease continuum encompasses three broad stages: preclinical, mild cognitive impairment, and dementia due to Alzheimer's disease.<sup>1,5,6</sup>

As the population ages, there is also an increase in systemic and age-related conditions. Improving the quality of life for individuals with Alzheimer's disease is at the forefront for families, caregivers, and health care providers. Interdisciplinary health care teams for individuals with Alzheimer's disease are necessary for patient-centered care (PCC). A systematic review of the literature and meta-analysis by Kim and Park included 19 studies for a total of 3,985 participants with dementia.<sup>7</sup> The review identified the positive effects of reducing agitation, neuropsychiatric symptoms, depression, and quality of life after introducing PCC models into clinical practice.<sup>7</sup> An interdisciplinary health care team can also improve the quality of life by managing Alzheimer's disease associated comorbidities. The comorbidities of hypertension, depression, diabetes, osteoarthritis, and cardiovascular disease play indirect and direct roles in Alzheimer's disease and can affect the trajectory of disease onset and progression.<sup>4,8,9</sup> While the physical and systemic presentations of Alzheimer's disease are apparent, dental considerations and implications have equal importance when considering patients' quality of life. The current literature suggests that individuals with Alzheimer's disease have a higher rate of caries, mucosal lesions, poor saliva quality

and quantity, gingival bleeding, attachment loss, and periodontitis than elderly adults without any degree of dementia.<sup>6,10-14</sup> Given the complexity of the disease, interdisciplinary health care teams' knowledge and attitudes are important factors to consider for PCC for individuals with Alzheimer's disease.

There are two reliable and valid instruments to measure Alzheimer's disease knowledge and dementia attitudes. In 2009, Carpenter et al. developed the 30-item Alzheimer's disease knowledge scale (ADKS).<sup>15</sup> The ADKS has acceptable internal consistency reliability (Cronbach's alpha = .71) and test-retest reliability ( $r = .81, p < .001$ ).<sup>15</sup> Additionally, the predictive ( $r = .50, p < .001$ ) and concurrent validity scores ( $r = .44, p < .001$ ) further support its use as an accurate instrument to assess knowledge.<sup>15</sup> In 2010, O'Connor et al. developed a 20-item dementia attitudes scale (DAS) to identify attitudes and social comfort scores.<sup>16</sup> This instrument demonstrates acceptable internal consistency reliability (Cronbach's alpha = .83-.85) and convergent validity ( $r = .50, p < .001$ ) when compared to other validated scales measuring ageism and attitudes toward disabilities.<sup>16</sup>

There is limited evidence in the literature regarding the knowledge, comfort, and attitudes of United States (US) dental, allied oral health (OH) and nursing students for individuals with Alzheimer's disease. Of the few existing international studies knowledge appears to be lacking, raising concerns about the proper treatment of patients with Alzheimer's disease. In 2015 Poreddi et al. reported on the knowledge and attitudes of 122 undergraduate nursing students in India using the ADKS and DAS.<sup>17</sup> The results of this pilot study found that students demonstrated inadequate knowledge of Alzheimer's, with overall mean scores of 56% correct on the ADKS.<sup>17</sup> However, while knowledge was lacking, students' attitudes were positive, with an overall mean score of 95 on the DAS.<sup>17</sup> Another study by Eccleston et al. in 2015 reported that second-year nursing students in Tasmania demonstrated below baseline levels of knowledge on Alzheimer's disease and emphasized its clinical importance as it relates to the field of nursing.<sup>18</sup> Evidence for nursing students' lack of

knowledge in Alzheimer's disease is echoed in a 2022 Jordanian study where a sample of 275 students was tested using the ADKS and DAS.<sup>19</sup> Students' overall mean scores on the ADKS and DAS were 61% and 65%, respectively.<sup>19</sup>

Even fewer studies have been performed that identify dental and allied OH students' level of knowledge and attitudes toward patients with Alzheimer's disease. Akifusa et al. conducted surveyed 122 dental hygiene students in Japan using an author-developed Alzheimer's disease and dementia knowledge questionnaire in 2019.<sup>20</sup> Results of the four-year prospective study found that as students progressed through the program, their knowledge of Alzheimer's disease and willingness to treat patients with Alzheimer's disease increased.<sup>20</sup> While few studies have been conducted to demonstrate the knowledge and attitudes of dental students, this cohort of students has been included in several multidisciplinary studies.<sup>20</sup> Additionally, dental and allied OH students are underrepresented in multidisciplinary studies, consisting of only a small proportion of the total sample. In a 2020 Saudi Arabia study by Al Arifi, approximately dental students were just 16% of their study sample.<sup>21</sup>

The knowledge and attitudes of dental, allied OH, and nursing students toward patients with Alzheimer's disease in the US is lacking. Much of the research on this topic has been performed internationally, demonstrating the need for a comprehensive understanding of the level of knowledge, comfort, and attitudes of health care professional students in the US towards patients with Alzheimer's disease. The purpose of this pilot study was to assess dental, allied oral health, and nursing students' perceived knowledge, comfort, and attitudes for individuals with Alzheimer's Disease using the ADKS and attitudes measures by DAS.

## **METHODS**

A cross-sectional, descriptive pilot study was conducted involving students from two University of

Minnesota (UMN) health professional schools, the UMN School of Dentistry (SOD) and the UMN School of Nursing (SON). The UMN Institutional Review Board (IRB) determined this study exempt from oversight (STUDY00001686).

An information sheet served as the informed consent embedded in the electronic survey platform (Qualtrics<sup>sm</sup>, Provo, UT, USA). The information sheet included the purpose of the study, the question format (true/false and Likert-scale), and the estimated length of time to complete the survey. A confidentiality statement was provided to inform participants that all identifiable information would be stored securely and only the research team would have access. A voluntary nature of study statement was included to inform the students that participation will not affect their current or future relationships with the UMN.

## **Instrument**

A 48-item electronic survey was developed to include four demographic questions, including the educational program type, age, gender, and highest degree obtained. The ADKS was comprised of 30 true/false questions that assessed students' knowledge of risk factors, assessment and diagnosis, symptoms, life impact, caregiving, treatment, and management of patients with Alzheimer's disease. Permission was granted by Carpenter et al. to use the previously published instrument.<sup>15</sup> The 11-item DAS determined students' comfort and attitudes on a 7-point Likert scale of "strongly disagree, disagree, slightly disagree, neutral, slightly agree, agree, strongly agree." The DAS instrument was available for re-use without permission.<sup>16</sup> Two additional questions to determine students' formal and informal exposure to individuals with Alzheimer's disease were developed from the literature and included in the survey.<sup>19,22,23</sup> The demographic questions were pilot tested by four dental research faculty members with experience in survey design to establish clarity before dissemination to participants. Because the ADKS and DAS are validated, reliable instruments they did not require pilot testing.

## Recruitment

The inclusion criteria included current UMN SOD students in color groups and SON students in their first or last semester in the Fall of 2022. Exclusion criteria included UMN SOD students not enrolled or not included in a color group and UMN SON not enrolled in Fall 2022. A convenience sample of (n=851) students were invited to participate in this pilot study. The sample from the UMN SOD included students assigned to color groups from four programs: Doctor of Dental Surgery (DDS), Master of Dental Therapy (MDT), Dental Therapy and Dental Hygiene dual degree (DH/DT), and Dental Hygiene (DH). All MDT, DH/DT dual degree and DH students were grouped in the allied oral health provider (OH) category (n=274). Students from the SOD are divided into color groups, allowing students to provide various dental services under the oversight of dental faculty. The UMN SOD is comprised of six color groups (blue, green, maroon, orange, yellow, and silver), each sharing the purpose of fostering clinical collaboration and enhancing learning through the presentation of case studies. The convenience sample from the UMN SON sample (NURS) included two cohorts, students enrolled in the first semester Bachelor of Science in Nursing and the last semester of the Master of Nursing program (n=577).

## Survey administration

An invitation to participate and a link to the survey was sent via email to the seven UMN SOD color group directors and the nursing program director to share with their students. Responses were captured on the survey platform and no manual data was entered. The information sheet that served as the informed consent, had a voluntary nature of study statement. At the conclusion of the survey participants had an option to enter their contact information to enter a raffle to win 1 of 5 \$100 gift cards. The survey was sent three times between the weeks of November 1st and December 12th, 2022. There was no randomization of items or adaptive questioning. The number of questions displayed on the screen and the number of screen pages were dependent on computer, tablet, or cellular phone access modes. Settings for completeness

check allowed one response and force response. Participants had the option to review prior questions. Email addresses were collected to prevent duplicated responses and to confirm that the participant had an active email associated with a health science program for eligibility purposes.

## Data analysis

Numeric measures were summarized using means and standard deviations, and categorical measures were summarized using counts and rates and measures were compared across groups using analysis of variance. Categorical measures were compared across groups using the chi-squared test for association. Statistical analysis was conducted using R version 4.2.2 (R Foundation for Statistical Computing, Vienna, AT).

## RESULTS

A total of 274 students completed the survey resulting in a 32.2% response rate. The programs with the majority of responses were the DDS (n=140) and the nursing (NURS) (n=93) cohorts. The most frequent age group for participants was 23-27 years of age (n=125). Most participants were female (n=202), and the predominant ethnicity was White (n=195). The highest reported degree was bachelors (n=154) followed by no prior degree (n=93). Based on statistical assessment, all student groups differed ( $p < 0.05$ ) regarding age, gender, and prior degree. Table I reflects the demographic information.

Students' perceived knowledge by the ADKS is shown in Table II. Percentages are based on the frequency of correct answers for the true/false questions on the ADKS for each of the three cohorts. Nursing students had the highest score (M=25.26) of correct responses. The questions most frequently answered correctly across all student groups were "People whose Alzheimer's disease is not yet severe can benefit from psychotherapy for depression and anxiety" (DDS=92.1%, OH 92.7%, NURS=92.5%) and "Alzheimer's disease cannot be cured" (DDS=91.4%, OH=97.6%, NURS=95.7%). Knowledge levels differed

**TABLE I. Demographics (n=274)**

	DDS (n=140)	Allied OH (n=41)	NURS (n=93)	
	n (%)	n (%)	n (%)	
<b>Program</b>				
Dental School	140 (100.0)	—	—	
Dual Degree Dental Hygiene/Dental Therapy	—	9 (22.0)	—	
Master of Dental Therapy	—	3 (7.3)	—	
Dental Hygiene	—	29 (70.7)	—	
Nursing	—	—	93 (100.0)	
<b>Program and Year</b>				
Dental school year 3 (Class of 2023)	71 (50.7)	—	—	
Dental school year 4 (Class of 2024)	69 (49.3)	—	—	
Dual degree dental hygiene/Dental therapy (Class of 2023)	—	3 (7.3)	—	
Dual degree dental hygiene/Dental therapy (Class of 2024)	—	9 (22.0)	—	
Dental hygiene senior (Class of 2023)	—	13 (31.7)	—	
Dental hygiene junior (Class of 2024)	—	16 (39.0)	—	
Bachelor of Science in Nursing (Sophomore)	—	—	22 (23.7)	
Bachelor of Science in Nursing (Junior)	—	—	29 (31.2)	
Bachelor of Science in Nursing (Senior)	—	—	21 (22.6)	
Master of Nursing (First Semester)	—	—	12 (12.9)	
Master of Nursing (Second Semester)	—	—	9 (9.7)	
<b>Age</b>				<b>p=&lt;0.001</b>
18-22	—	25 (61.0)	73 (78.5)	
23-27	101 (72.1)	13 (31.7)	11 (11.8)	
28-33	30 (21.4)	3 (7.3)	5 (5.4)	
33+	9 (6.4)	—	4 (4.3)	
<b>Gender</b>				<b>p=&lt;0.001</b>
Male	65 (46.4)	3 (7.3)	4 (4.3)	
Female	75 (53.6)	38 (92.7)	89 (95.7)	
Non-binary/ third gender	—	—	—	
Prefer not to disclose	—	—	—	

**TABLE I. Demographics (n=274) continued**

	DDS (n=140)	Allied OH (n=41)	NURS (n=93)	
	n (%)	n (%)	n (%)	
<b>Ethnicity</b>				<b>p=0.002</b>
White	101 (72.1)	23 (56.1)	71 (76.3)	
Black or African American	—	5 (12.2)	9 (9.7)	
American Indian or Alaska Native	—	—	—	
Asian	27 (19.3)	7 (17.1)	10 (10.8)	
Native Hawaiian or Pacific Islander	—	—	—	
Hispanic	5 (3.6)	5 (12.2)	1 (1.1)	
Multicultural	7 (4.9)	1 (2.4)	2 (2.2)	
<b>Highest degree held</b>				<b>p=&lt;0.001</b>
No prior degree	1 (0.7)	22 (53.7)	70 (75.3)	
Associate degree	—	5 (12.2)	2 (2.2)	
Bachelor's degree	122 (87.1)	14 (34.1)	18 (19.4)	
Master's degree	10 (7.1)	—	3 (3.2)	
Doctorate degree	7 (5.0)	—	—	

Doctor of dental surgery (DDS) student; Allied Oral Health (OH) students (include: Master of Dental Therapy (MDT), dual degree dental hygiene/dental therapy (DH/DT), and dental hygiene (DH); Nursing (NURS); n(%), significance <0.05\*

among programs ( $p < 0.05$ ), with the NURS cohort demonstrating higher levels of knowledge when compared to the DDS and OH groups. The only question with statistical significance that received higher knowledge scores than the nursing cohort was, “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;” the DDS cohort demonstrated greater knowledge for this item. The overall analysis of knowledge as measured by the ADKS demonstrated statistically significant means (DDS  $M=23.4$ ,  $SD 3.26$ ), OH ( $M=22.10$ ,  $SD 2.98$ ), NURS ( $M=25.26$ ,  $SD 2.97$ ) between the three cohorts.

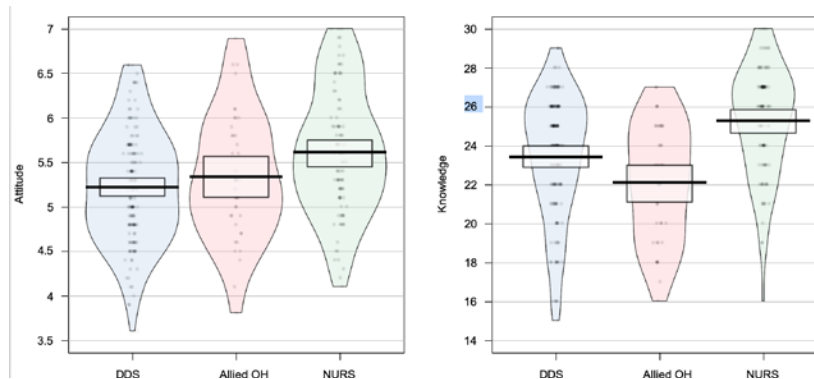
Perceived attitudes of the participants as measured by the DAS are shown in Table III; a high score implies a positive attitude. Responses to the statements “Every person with Alzheimer’s disease and related dementias (ADRD) has different needs” and “Difficult behaviors

may be a form of communication for people with ADRD” demonstrated significance between all cohorts. Comfort levels differed among programs ( $p < .05$ ), with NURS respondents demonstrating the highest level of comfort ( $M=5.61$ ,  $SD 0.71$ ) and DDS respondents demonstrating the lowest level of comfort ( $M=5.11$ ,  $SD 0.64$ ) in treating patients with Alzheimer’s disease. A comparison of the respondent groups’ attitudes and knowledge scores is illustrated in Figure 1.

Data collected on the respondents’ formal and informal exposure to Alzheimer’s disease is shown in Table IV. Nursing students indicated the greatest amount of formal exposure (62.4%), with the majority of the experiences being in the form of formal education (44.1%). Types of exposure to Alzheimer’s disease differed among programs ( $p < 0.05$ ), with dental students indicating the highest amount of informal exposure to Alzheimer’s disease (74.3%), with

the majority of the experiences due to exposure in the clinical setting (42.1%). Across all respondent groups, clinical exposure and having a close friend with Alzheimer's disease were the least common forms of formal exposure (DDS n=7, 5%; OH n=2, 4.8%; NURS n=21, 22.6%) and informal exposure (DDS n=1, 0.7%; OH n=0; NURS n=2, 2.2%).

**Figure 1. Respondents' Attitude and Knowledge Scores†**



† Maximum attitude score = 7; maximum knowledge score = 30

## DISCUSSION

This pilot study aimed to address the gap in the literature on the perceived knowledge, comfort, and attitudes of dental, allied oral health and nursing students in the US on treating patients with Alzheimer's disease. With the population living longer, US health science education programs must train students to work and collaborate in health care systems that treat patients with complex medical histories, age-related diseases, and Alzheimer's disease. To prepare dental, allied oral health, and nursing students to be competent providers for this population, it is important to understand the perceived knowledge and comfort level of these student groups to identify areas within the curriculum that can be improved to enhance knowledge, comfort, and attitudes. Differences in cultural norms and societal views on health, wellness, and aging could invite the opportunity for new ideas and approaches to providing comprehensive care to patients with Alzheimer's disease. Additionally, with increasing popularity surrounding the shift toward holistic health approaches and PCC, collecting perceptions from multiple healthcare disciplines will be critical to integrating members of health care teams.

In this pilot study, nursing students demonstrated the highest level of knowledge, followed by dental students, and lastly allied oral health students, who demonstrated the lowest. While no known studies comprise a similar sample, in a previous study nursing students scored higher than other medical-related disciplines such as pharmacy, public health and dentistry.<sup>24</sup> Nursing students may demonstrate higher levels of knowledge of Alzheimer's disease due to greater exposure based on the nature of their clinical rotation location that may include hospitals, medical clinics, nursing and assisted living facilities, and hospice care. In comparison, dental and allied oral health providers primarily practice in dental clinic settings and may not provide care to patients with Alzheimer's disease as frequently as nursing students. The clinical practice location and type of exposure, where the participants students had the opportunity to learn and apply their educational program knowledge may have influenced the results of this pilot study. This is supported by a study by Chan et al. which found that both formal and informal exposures to Alzheimer's disease increased student knowledge levels.<sup>22</sup> Nursing students have also reported more formal educational training on Alzheimer's disease as compared to students in dental fields. Multiple explanations exist to explain why dental outperformed the allied students. First, dental students reported having more education in the form of prior degrees than the allied oral health students; it is possible that Alzheimer's disease was taught at some point in their prior education. Second, dental students' average age was older than the allied oral health students. This demographic difference may simply translate to more lived experiences

**TABLE II. Respondents<sup>†</sup> perceived knowledge by Alzheimer's Disease Knowledge Scale (n=274)**

		DDS	Allied OH	NURS	
		n=140	n=41	n=93	
Survey statement	True/ False	Correct Responses			
		n(%)	n(%)	n(%)	p-value*
People with Alzheimer's disease are particularly prone to depression.	T	126 (90.0)	37 (90.2)	83 (89.2)	0.977
It has been scientifically proven that mental exercise can prevent a person from getting Alzheimer's disease.	F	57 (40.7)	20 (48.8)	53 (57.0)	0.051*
After symptoms of Alzheimer's disease appear, the average life expectancy is 6 to 12 years.	T	106 (75.5)	23 (56.1)	68 (73.1)	0.046*
When a person with Alzheimer's disease becomes agitated, a medical examination might reveal other health problems that caused the agitation.	T	113 (80.7)	27 (65.9)	77 (82.8)	0.069
People with Alzheimer's disease do best with simple instructions giving on step at a time.	T	136 (97.1)	39 (95.1)	90 (96.8)	0.815
When people with Alzheimer's disease begin to have difficulty taking care of themselves, caregivers should take over right away.	F	80 (57.1)	19 (46.3)	86 (92.5)	<0.001*
If a person with Alzheimer's disease becomes alert and agitate at night, a good strategy is to try to make sure that the person gets plenty of physical activity during the day.	T	120 (85.7)	36 (87.8)	85 (91.4)	0.426
In rare cases, people have recovered from Alzheimer's disease.	F	94 (67.1)	27 (65.9)	74 (79.6)	0.088
People whose Alzheimer's disease is not yet severe can benefit from psychotherapy for depression and anxiety.	T	129 (92.1)	38 (92.7)	86 (92.5)	0.992
If trouble with memory and confused thinking appears suddenly, it is likely due to Alzheimer's disease.	F	113 (80.7)	31 (75.6)	90 (96.8)	<0.001*
Most people with Alzheimer's disease live in nursing homes.	F	80 (57.1)	28 (68.3)	78 (83.9)	<0.001*
Poor nutrition can make the symptoms of Alzheimer's disease worse.	T	136 (97.1)	36 (87.8)	91 (97.8)	0.015*
People in their 30s can have Alzheimer's disease.	T	124 (88.6)	32 (78.0)	79 (84.9)	0.228
A person with Alzheimer's disease becomes increasingly likely to fall down as the disease gets worse.	T	133 (95.0)	35 (85.4)	89 (95.7)	0.051*
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.	F	94 (67.1)	33 (80.5)	85 (91.4)	<0.001*
Once people have Alzheimer's disease, they are no longer capable of making informed decisions about their care.	F	81 (57.9)	19 (46.3)	82 (88.2)	<0.001*



**TABLE II. Respondents<sup>†</sup> perceived knowledge by Alzheimer's Disease Knowledge Scale (n=274) Continued**

		DDS	Allied OH	NURS	
		n=140	n=41	n=93	
Survey statement	True/ False	Correct Responses			
		n(%)	n(%)	n(%)	p-value*
Eventually, a person with Alzheimer's disease will need 24-hour supervision.	T	108 (77.1)	33 (80.5)	58 (62.4)	0.022
Having high cholesterol may increase a person's risk of developing Alzheimer's disease.	T	122 (87.1)	27 (65.9)	73 (78.5)	0.007*
Tremor or shaking of the hands or arms are common symptoms in people with Alzheimer's disease.	F	71 (50.7)	18 (43.9)	58 (62.4)	0.087
Symptoms of severe depression can be mistaken for symptoms of Alzheimer's disease.	T	109 (77.9)	29 (70.7)	63 (67.7)	0.213
Alzheimer's disease is one type of dementia.	T	128 (91.4)	37 (90.2)	82 (88.2)	0.716
Trouble handling money or paying bills is a common early symptom of Alzheimer's disease.	T	112 (80.0)	28 (68.3)	71 (76.3)	0.288
One symptom that can occur with Alzheimer's disease is believing that other people are stealing one's things.	T	126 (90.0)	35 (85.4)	79 (84.9)	0.465
When a person has Alzheimer's disease, using reminder notes is a crutch that can contribute to decline.	F	95 (67.9)	22 (53.7)	78 (83.9)	0.001*
Prescription drugs that prevent Alzheimer's disease are available.	F	102 (72.9)	29 (70.7)	83 (89.2)	0.006*
Having high blood pressure may increase a person's risk of developing AD	T	121 (86.4)	26 (63.4)	68 (73.1)	0.002*
Genes can only partially account for the development of Alzheimer's disease.	T	125 (89.3)	32 (78.0)	86 (92.5)	0.050*
It is safe for people with Alzheimer's disease to drive, as long as they have a companion in the car at all times.	F	101 (72.1)	37 (90.2)	84 (90.3)	0.001*
Alzheimer's disease cannot be cured.	T	128 (91.4)	40 (97.6)	89 (95.7)	0.232
Most people with Alzheimer's disease remember recent events better than thinks that happened in the past.	F	106 (75.7)	33 (80.5)	81 (87.1)	0.101
Knowledge Mean score (SD) <sup>‡</sup>		23.4 (3.26)	22.10 (2.98)	25.26 (2.87)	<0.001*

<sup>†</sup>Doctor of dental surgery (DDS) student; Allied Oral Health (OH) students (includes Master of Dental Therapy (MDT), dual degree dental therapy/dental hygiene (DH/DT), and dental hygiene (DH); Nursing (NURS)

<sup>‡</sup>Mean scores based on the total number of correct answers.

\* p=<0.05

**TABLE III. Perceived attitudes by the Dementia Attitudes Scale (n=274)**

	DDS	Allied OH	NURS	
Survey statement	Mean (SD) ‡	Mean (SD) ‡	Mean (SD) ‡	p-value*
I am afraid of people with ADRD.†	5.88 (1.16)	6.05 (1.07)	6.12 (1.16)	0.276
I feel confident around people with ADRD.	4.44 (1.27)	4.56 (1.50)	4.87 (1.49)	0.069
I am comfortable touching people with ADRD.	5.06 (1.27)	5.07 (1.47)	5.60 (1.26)	0.006
I feel uncomfortable being around people with ADRD.	5.10 (1.49)	5.17 (1.73)	5.41 (1.60)	0.332
Every person with ADRD has different needs.	6.21 (0.85)	6.66 (0.48)	6.71 (0.50)	<0.001
It is important to know the past history of people with ADRD.	6.10 (0.91)	6.22 (0.79)	6.43 (0.76)	0.015
I feel relaxed around people with ADRD.	4.36 (1.19)	4.51 (1.25)	4.70 (1.30)	0.12
People with ADRD can feel when others are kind to them.	6.12 (0.93)	6.15 (1.13)	6.37 (1.06)	0.177
I feel frustrated because I do not know how to help people with ADRD.	3.74 (1.41)	3.80 (1.82)	3.96 (1.55)	0.573
Difficult behaviors may be a form of communication for people with ADRD.	5.21 (1.00)	5.17 (1.18)	5.94 (1.12)	<0.001
<b>Attitude totals</b>	<b>5.22 (0.64)</b>	<b>5.34 (0.71)</b>	<b>5.61 (0.71)</b>	<b>&lt;0.001</b>

†Alzheimer’s disease and related dementias

‡Means scores measured on a 7-point Likert scale (1=strongly disagree, 2=disagree, 3=slightly disagree, 4=neutral, 5=slightly agree, 6=agree, 7=strongly agree).

\* p=<0.05

that exposed them to sources of knowledge on Alzheimer’s disease. Dental students also reported a high percentage of informal exposure to Alzheimer’s disease which aligns with the findings from the Chan et al. study.<sup>22</sup> Lastly, Alzheimer’s disease is presented in the curriculum for allied oral health students during a single lecture in one course; dental students at the SOD receive information on Alzheimer’s disease in two courses. Dental students are enrolled in “Special Issues in Oral Health Care: Geriatric, Special Needs, and Hospital Dentistry,” which spans an entire semester providing more comprehensive training on diseases within the geriatric population, including Alzheimer’s disease. Results of this pilot study provide evidence that an expanded didactic curriculum focused on special issues in health care could enhance knowledge in Alzheimer’s disease for allied oral health students.

Nursing students demonstrated the most positive attitudes toward patients with Alzheimer’s disease; positive attitudes of nursing students as measured by DAS are consistent with previous studies<sup>19</sup> This could be due to the high number of female providers in the nursing cohort. Furthermore, there was statistically significant number of females as compared to males in all student groups. There is evidence suggesting that the patients of female health care providers receive a higher quality of care which may allow them to embody more positive attitudes toward their patients.<sup>25</sup> Similar to the knowledge assessments, nursing students’ level of formal and informal exposure to individuals with Alzheimer’s disease was higher compared to the other student groups. It is not surprising that nursing students have an increased amounts of quality exposures in all types of formal settings with patients with Alzheimer’s disease. It is believed that

**Table IV. Respondents<sup>†</sup> formal and informal exposure to Alzheimer's disease (n=240)**

	<b>DDS (n=140)</b>	<b>OH (n=41)</b>	<b>NURS (n=93)</b>	
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	<b>p-value*</b>
<b>Formal</b>	35 (25.0)	8 (19.5)	58 (62.4)	<0.001*
Educational	30 (21.4)	4 (9.8)	41 (44.1)	<0.001*
Clinical	7 (5.0)	2 (4.9)	21 (22.6)	<0.001*
Professional Experience	7 (5.0)	4 (9.8)	32 (34.4)	<0.001*
<b>Informal</b>	104 (74.3)	25 (61.0)	73 (78.5)	0.103
Clinical	59 (42.1)	15 (36.6)	51 (54.8)	0.074
Extended family member	36 (25.7)	8 (19.5)	35 (37.6)	0.052*
Close family member	36 (25.7)	4 (9.8)	23 (24.7)	0.091
Close friend	1 (0.7)	--	2 (2.2)	0.45
Acquaintance	10 (7.1)	3 (7.3)	3 (3.2)	0.417

†Doctor of dental surgery (DDS) student; Allied Oral Health (OH) students (includes Master of Dental Therapy (MDT), dual degree dental hygiene/dental therapy (DH/DT), and dental hygiene (DH); Nursing (NURS) \*p=<0.05

their educational training and clinical exposures play a positive role in nursing students' attitudes.

Dental student participants demonstrated the lowest comfort level and least positive attitudes toward patients with Alzheimer's disease in this pilot study. This was an interesting result, especially since dental respondents reported a number of informal Alzheimer's disease exposures. Since informal exposures include family members and close friends, it is possible that attitudes may have been influenced by negative personal experiences. Dental students also reported a more diverse age range which could invite the idea that individuals they know with Alzheimer's disease may be experiencing more advanced stages of Alzheimer's disease. However, this trend was not observed in the nursing cohort, which also reported a significant amount of formal and informal exposure. Another interesting finding from this study was that even though dental students demonstrated having more knowledge of Alzheimer's disease than allied oral health students, their overall comfort and attitudes toward Alzheimer's disease were lower. It was also interesting that allied oral health students had a higher perceived attitudes and comfort

treating patients with Alzheimer's disease considering that they had the lowest knowledge scores suggesting that possessing high levels of knowledge may not correlate to perceived positive attitudes or comfort in providing treatment for Alzheimer's disease patients. The allied oral health respondents' perception of their attitudes and comfort may have been influenced by their overall confidence in their knowledge of clinical care and patient management.

Limitations to this pilot study include a low response rate for nursing students (16.7%) which reduces the generalizability of the findings. Additionally, the sample was limited to one University system within a Midwestern metropolitan area. In addition, an attempt was made to include medical and pharmacy students, but it was not successful further limiting the study's reach. The demographic data indicated a sample with diverse cultural backgrounds which may have affected their attitudes towards individuals with Alzheimer's disease due to varying views on wellness and aging. Lastly, curricular information for Alzheimer's disease was not provided obtained by the SON making it unclear regarding the amount of formal exposure embedded within the SON curriculum. However, based

on the results of this study, it could be assumed that more formal training is provided to nursing students as compared to dental and allied oral health students.

This is the first known pilot study to assess the knowledge and attitudes of dental, allied oral health, and nursing students in the US. Two existing validated and reliable instruments (ADKS and DAS) are available to replicate this study at a national level to obtain more generalizable outcomes. The benefit of determining dental, allied oral health and nursing students' knowledge and attitudes may provide information for a more standardized curriculum on Alzheimer's disease to prepare future health care providers to participate in the interdisciplinary health care teams that are critical for PCC for individuals with Alzheimer's disease. Understanding how to enhance the knowledge of allied oral health students and improve the attitudes of dental students may prepare them to collaborate in interdisciplinary teams with nurses to meet the expected needs of health care systems to care for individuals living with Alzheimer's disease.

## CONCLUSIONS

This pilot study provided insight into dental, allied oral health, and nursing students' perceived knowledge, comfort, and attitudes toward individuals with Alzheimer's disease. Nursing students demonstrated higher knowledge and more positive attitudes toward Alzheimer's disease than dental and allied oral health students. These findings may indicate the need for additional educational training and an expanded didactic curriculum to enhance knowledge for dental and allied oral health students. This pilot study provides a blueprint for replication on national level. Given the growing number of individuals with Alzheimer's disease within the US population, understanding the level of knowledge and perceived comfort and attitudes of dental, allied health is vital for ensuring competence and the delivery of PPC for individuals with Alzheimer's disease on interdisciplinary health care teams.

## DISCLOSURES

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