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**Alzheimer's Disease (AD) knowledge in Korean Americans: Identifying  
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# Alzheimer's Disease (AD) knowledge in Korean Americans: Identifying knowledge gaps and misconceptions and examining predictors of AD knowledge

## Abstract

**Objectives:** This study examined Alzheimer's disease (AD) knowledge and its predictors among Korean Americans (KAs). **Design:** Convenience sampling was used to recruit KAs in the Greater Washington metropolitan area. A total of 268 KAs participated in the study and completed a cross-sectional survey in 2014. Using the Alzheimer's Disease Knowledge Scale (ADKS), overall and domain knowledge was assessed. Multiple regression analyses were conducted for overall and domain knowledge with predictors including exposure to AD, social engagement, sources and frequency of health-related information, stigmatic beliefs (pity, antipathy, and social distance), English proficiency, and education. **Results:** KAs reported 59% accuracy in overall AD knowledge. At the domain level, KAs were most knowledgeable about assessment and diagnosis and least knowledgeable about caregiving. **Our regression analyses showed that** having a college degree or higher is associated with greater overall AD knowledge. Three domain models of life impact, risk factors, and caregiving turned out to be significant: Having a college degree or higher is a predictor of greater knowledge in all three domains. Having more pity stigmatic beliefs is related to greater knowledge in both life impact and caregiving domains while having less pity stigmatic beliefs is associated with more risk factor knowledge; having less social distance stigmatic beliefs is associated with greater life impact knowledge; and having less antipathy stigmatic beliefs is related to better caregiving knowledge. **Conclusion:** Our findings revealed areas of misconceptions and knowledge gaps in KAs which need to be addressed in educational interventions. Different knowledge status across the domains

demonstrates a multi-dimensional nature of AD knowledge. Multivariate findings confirmed the robust role of education in overall and domain AD knowledge. Effect of different AD stigmatic beliefs on certain **AD knowledge domains** suggests ways of how stigma change can be efficient for the purpose of increasing AD domain knowledge in KAs.

Keywords: Alzheimer's disease, dementia, knowledge, stigma, Korean American, Asian American

## Introduction

Alzheimer's disease (AD) is the most common type of dementia, accounting for 60% to 80% of total dementia cases (Alzheimer's Association, 2021). With the baby boomer population aging and old age being the strongest known risk factor, older Americans affected by AD will only grow: In 2020, around 6 million older Americans were **estimated to have** AD, and the number is projected to increase by 128% to 13.8 million in 2060 (Rajan et al., 2021). AD was the sixth leading cause of death in 2019 in the U.S. (Kochanek et al., 2020) but its cost of care including direct medical cost, implicit informal cost of care, and out-of-pocket spending is substantially greater than that of other causes of death (Kelley et al., 2015). **Thus**, AD has been recognized as a public health concern and priority in the U.S. since 2012 (U.S. Department of Health & Human Services [DHHS], 2020).

**Prior studies** showed that AD knowledge is related to health-related decisions and behaviors: Greater AD knowledge was associated with help-seeking (Mukadam et al., 2011; Werner, 2003), more positive attitudes toward seeking treatment (Watari & Gatz, 2004), being more likely to communicate diagnosis and test results with family and friends (Rostamzadeh et al., 2020), and being more likely to have made plans for the possibility of AD (Jang et al., 2018). On the other hand, **misinformation about AD can act as barriers to screening (e.g., ignoring early signs as normal aging) and appropriate care (e.g., perceiving behavioral symptoms as failure of moral and thus confronting the symptoms with reasonings or trying to modify them)** (Edward et al., 2000). **Given the importance of** increasing awareness and disseminating correct disease information in the public, enhancing public awareness has been set as one of the goals in the National Alzheimer's Project Act (NAPA) in the U.S. (U.S. DHHS, 2020).

Research on assessing public's knowledge about AD can be relevant for designing effective educational interventions and campaigns because their contents can be based on what people do/do not know rather than what experts think people should know (Cahill et al., 2015). A theoretical framework **such as** common-sense model (CSM) of self-regulation of health and illness supports this line of research. CSM argues that lay people construct their knowledge about a disease as common-sense scientists and their constructed knowledge is used to decide how to respond, therefore, contents of educational programs should reflect people's constructed knowledge of specific illnesses (Leventhal et al., 2003). Two systematic review studies about AD knowledge provided **some** information about general public's AD knowledge in the U.S. The first **review** study **with 40 articles published** from 1995 to 2014 reported that the public had fair to moderate knowledge and had good awareness about AD and its symptoms, but lacked in specific aspects such as causes, treatment, and risk factors (**Cahill et al., 2015**). Two misconceptions are identified across the studies reviewed: Dementia is a normal part of aging, and knowledge about modifiable risk factors is poor. As a follow-up study of Cahill and colleagues, Cations and associates (2018) reviewed 33 studies between 2012 and 2017 and noted some trends: Awareness of AD improved over time; knowledge about modifiable risk factors, such as cardiovascular ones, was still limited; and the misconception of dementia as a normal part of aging was still persistent. Despite an upward trend about the awareness and familiarity with AD in the public, these reviews clearly showed that disseminating correct information about specific aspects of AD in the public **is still needed**.

Another aspect of dementia phenomena is dementia in ethnic minority populations. **In particular, there is an increasing demand for dementia research** for the Asian American (AA) population. **This** population grew faster than any other racial and ethnic groups between

2000 and 2019 with 81% increase and is projected to triple their 2000 population by 2060, reaching 35.8 million (Budiman & Ruiz, 2021). AA's older population is one of the fastest growing older populations in the U.S: It grew 73% between 2000 and 2010 and is projected to grow 352% by 2060, **making up** about 21% of the AA population (National Asian Pacific Center on Aging, 2013). Therefore, it is anticipated that more Asian Americans will be affected by dementia in the coming years. A recent meta-analysis of **41** Alzheimer's Disease and its related dementias studies **with** Asian American, Native, Hawaiian, and Pacific Islanders (Lim et al., 2020) examined disease knowledge and reported that the population had little knowledge and normalization and stigmatizing attitudes were prevalent in the population. Additionally, their specific disease knowledge such as risk factors was more limited than Non-Hispanic Whites.

When studying AAs, oversimplifying the population should be cautioned because there are 25 subgroups recognized in the U.S. Census (Hoeffel et al., 2012), and intra-ethnic diversity within the population exists in terms of immigration history, socioeconomic status, family relationship, social and ethical philosophy, religion, and language (Nugraheni & Hastings, 2021). This means that there can be within group differences in the AD knowledge status by subgroups of AAs. For example, Liang and colleagues (2020) found that certain beliefs about AD varied across the AA subgroups in their sample of over 2,000 participants: **Sixty-three percent of Vietnamese Americans believed AD as normal aging compared to 40% to 49% of other Asian subgroups including Chinese, Asian Indians, Koreans, and Filipinos;** and feeling of embarrassment was most prominent in Chinese Americans (10%) whereas 2% to 6% of other AA subgroups held such belief. Absence of disaggregated data by **AA subgroups** in dementia research is well noted in the meta-analysis study by Lim and colleagues where the majority of the studies (118 out of 177) are about Chinese and Japanese Americans, which is understandable

given their sizes and length of immigration history. Certainly, more research about AD knowledge by AA subgroups is urged so group-specific needs can be identified for educational interventions.

Among the subgroups of AAs, Korean Americans (KAs) are the fifth largest one and comprise 10% of AA population (Hoeffel et al., 2012). Its size has steadily grown from 1.2 million in 2000 to 1.9 million in 2019 (Pew Research Center, 2021). Studies reported some indications that AD knowledge plays a significant role in KAs. For example, limited AD knowledge was identified as the most common barrier to utilize public services by KA caregivers (Park et al., 2020); greater AD knowledge predicts more intention for advanced care planning in AD situation (Hong et al., 2019); and less AD knowledge is related to increased feeling of shame for having a family member with AD (Jang et al., 2010). However, studies about **assessing** AD knowledge in the general KAs are sparse, and we could only locate a handful of studies that directly assessed the topic. Three studies attempted to measure objective knowledge using items addressing factual information about AD. Common misconceptions emerged in those studies are: AD is a form of insanity (41% in Watari & Gatz, 2004; 74% in Lee et al., 2009; 42% in Jang et al., 2010); and AD is a normal aging process (38% in Lee et al., 2009; 54% in Jang et al., 2010). A recent study by Park and colleagues (2021) assessed subjective AD knowledge in over 2,000 KAs, and majority (73%) acknowledged lack of knowledge by responding that they knew none, little, or somewhat about AD. **Although** these studies provided **some preliminary** understanding about the status of AD knowledge in KAs, **it** is not enough to draw any definitive conclusions. **In addition, use of** different and unstandardized measures **prevents** direct comparisons **of knowledge status** across **these** studies.



**Combined together, there is an urgent need for** more research about AD knowledge in KAs **and, therefore, we posed two main research questions.** Our first research question is **what the status of AD knowledge in the general KAs is.** **By answering this question,** we can identify knowledge areas that we need to pay attention to in educational efforts. **Use of a** standardized measure of AD knowledge **in our study would** allow us to assess not only the overall but also domain **specific** knowledge given the multi-faceted nature of disease knowledge. **Furthermore,** our results can be compared with other studies **that** used the same AD knowledge measure.

**Our second research question is what the predictors of AD knowledge in KAs are** so we can understand the context of their AD knowledge and identify protective and adverse factors. **Such information** can be useful in targeting certain segments of the population when implementing educational interventions. **Informed by prior research, we included the following variables as potential predictors:** Exposure to AD, social engagement, sources and frequency of getting health-related information, stigmatic beliefs, English proficiency, and education. For example, knowing someone affected by AD (Carpenter et al., 2011, Lee et al., 2009; Park et al., 2021), having a larger social network (Park et al., 2021) and more sources of information (Carpenter et al., 2011; Nagel et al., 2021; Werner, 2001), holding less stigmatic beliefs (e.g., fatalism, stigmatizing as mental illness) (Sun et al., 2014), and being more proficient in English or more acculturated (Ayalon & Arean, 2004; Lee et al., 2009; Jang et al., 2010; Park et al., 2021) are associated with greater AD knowledge. Education was found as a robust predictor in many studies, and more educated individuals have greater AD knowledge (Cahill et al., 2015; Edward et al., 2000; Jang et al., 2010; Park et al., 2021; Sun et al., 2014; Watari & Gatz, 2004; Werner, 2001). These factors could create more familiarity with the

disease, generate more opportunities to acquire and seek disease information in mass/social media and social settings.

## Methods

### *Participants and data collection*

Eligibility criteria included being self-identified KA and age 40 years or older. We used age 40 and older as a criterion because middle-aged and older KAs are likely affected by Alzheimer's disease as either patients or caregivers. Using convenience sampling, two bilingual KA researchers recruited participants from various locations in the KA community in the Greater Washington metropolitan area such as churches, community events and activities, business sites, and community centers. A total of 268 participants completed a cross-sectional survey in 2014.

The survey materials were developed in English first and then translated into Korean using Brislin's back-translation methods (Brislin, 1970). All participants completed the survey in Korean through self-administration (n=250) or face-to-face interview (n=18), which was up to their preferences. Informed consent was obtained prior to administering the survey, and it took up to an hour to complete the survey. All procedures were approved by the University of Maryland, Baltimore's Institutional Review Board.

### *Measures*

Our dependent variable, *AD knowledge*, was assessed using the Alzheimer's Disease Knowledge Scale (ADKS). The ADKS was developed and validated for the use of the general public and contains representative items of general knowledge (Carpenter et al., 2009). The Korea version of the ADKS was found to be psychometrically sound with general Koreans (Kim & Jung, 2015). With 30 true/false items (shown in Table 2), the ADKS covers seven domains of AD knowledge including risk factors (6 items), assessment and diagnosis (4 items), symptoms (4

items), course (4 items), life impact (3 items), caregiving (5 items), and treatment and management (4 items). Each item was coded as 0 = incorrect and 1=correct, and summative scores were calculated for total scale and each domain. Higher scores indicate having more correct knowledge about AD. The total scale showed acceptable reliability with the study sample, with internal consistency of  $\alpha = .71$ .

*Independent variables include exposure to AD, social engagement, sources and frequency of health-related information, stigmatic beliefs, English proficiency, and education. Exposure to AD* was assessed by asking whether they had known someone with AD with response options of 1=yes and 0 = no.

*Social engagement was measured* using four items from Social Engagement Composite Measure (Thomas, 2011). **The items asked** participants **about** how often they talk on the phone with friends and relatives, get together with friends, attend meetings, clubs, or organizations, and attend religious services, respectively. Response options ranged from 1= never to 6= more than once a day/week. Summative scores were calculated indicating higher scores as being more socially engaged. The internal consistency of  $\alpha$  for this 4-item scale was .63.

*Sources and frequency of getting health related information* were assessed by asking how often they get health related information from **three** informal sources (family & relatives, Korean friends, American Friends), **five** ethnic sources (Korean newspaper/TV/radio, hospital/clinic/doctor's office, religious organizations, local service agencies/community organizations, **and** online), and **five** mainstream sources (American newspaper/TV/radio, hospital/clinic/doctor's office, religious organizations, local service agencies/community organizations, **and** online). Participants answered 1=never to 5= always for each item.

Summative scores were calculated with higher scores indicating more frequent use of health information from various sources.

*Stigmatic beliefs* were assessed using three domains of public stigma identified in a study by Lee and colleagues (2021) based on the Family Stigma in Alzheimer's Disease Scale (FS-ADS; Werner et al., 2011). For *pity* (6 items of positive emotions; sadness, concern, sympathy, sorrow, pity, and compassion) and *antipathy* (4 items of negative emotions; shame, embarrassment, disgust, and disgrace) domains, participants were asked to rate to what extent they agree that other people feel about a person with AD using each descriptive word listed above and responded with a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). For *social distance* domain (6 items of behavioral discrimination; limiting social contact, limiting family ties, avoiding, ignoring, keeping away from the person, and keeping the person away from the public), participants indicated the extent of their agreement with six statements describing behavioral reaction in social relationship listed above. For all three domains, summative scores were calculated, with higher scores indicating having more stigmatic beliefs about each domain. All three domains showed excellent reliability with the study sample:  $\alpha = .94$  for *pity*,  $\alpha = .91$  for *antipathy*, and  $\alpha = .90$  for *social distance*.

*English proficiency* was assessed in three areas, comprehension, speaking, and reading, with ratings of 1=not well at all to 4=very well in each area. Summative scores were calculated with higher scores indicating being more proficient in English. *Education was measured as a dichotomous variable (0=no college education and 1= college education or higher).*

*Control variables included age (in years) and gender (1=male and 0=female). Additional sociodemographic characteristics were collected to describe the sample including annual*

household income (1=less than \$20,000 through 6= \$100,000 or higher), marital status (1=married and 0=not married), and years in the U.S.

### *Analysis*

Descriptive statistics were used to summarize the sample characteristics and the status of overall and domain knowledge of AD. To identify predictors of AD knowledge, multiple regression analyses were used for total and domain knowledge. Potential predictors informed by prior studies include exposure to AD, social engagement, sources and frequency of health-related information, stigmatic beliefs, English proficiency, and education. Age and gender were included as covariates. All analyses were conducted using IBM SPSS Statistics 26.0.

## **Results**

### *Sample characteristics*

Table 1 presents the characteristics of the sample. The mean age of the participants was 54. The majority was female (61%) and married (81%) and had an annual household income of less than \$60,000 (68%). Slightly less than half (49%) had college degree or higher, and 39% had known someone with AD. On average, they lived in the U.S. for 20 years. Among the stigmatic belief, *pity* was most prominent ( $M=19.9$ ,  $SD=6.9$ ) followed by *social distance* ( $M=17.6$ ,  $SD=5.8$ ), and *antipathy* ( $M= 8.9$ ,  $SD=4.0$ ).

### *Status of AD knowledge*

The status of AD knowledge in the sample is presented in Table 2. Participants **showed 59% accuracy in overall AD knowledge**. Among the domains of AD knowledge, they were most knowledgeable about assessment and diagnosis (70% accuracy) followed by life impact (67%), symptoms (61%), and treatment and management (60%). Certain aspects of the disease knowledge in those domains were well-known: Agitation can be caused by health problems other

than AD (true; 94%), AD is a type of dementia (true; 87%), individuals with AD are likely to experience depression (true; 82%), psychotherapy for depression and anxiety can benefit early stage of AD (true; 85%), and having trouble in handling money is a common early symptom (true; 71%). It is notable that majority (66%) incorrectly knew that sudden appearance of memory trouble and confusion is likely due to AD.

Caregiving domain shows the poorest knowledge level with 48% accuracy. While majority correctly knew certain aspects about caregiving such that getting physical activity during the day could help nighttime alert and agitation (87%) and simple instructions of one step at a time is effective (81%), only small number of participants correctly knew that reminding about repeating the same questions and stories is not helpful (38%) and people with AD are still capable of making informed decision about their own care (33%). Vast majority (96%) incorrectly believed that caregiving should take over right away when individuals with AD start having difficulty taking care of themselves.

Risk factors and course domains show fair to moderate level of knowledge (57% accuracy in both domains). Those domains have a mix of well-known facts and misconceptions: Many correctly knew that genes only partially account for developing AD (73%), high blood pressure (60%) and high cholesterol (59%) may increase the risk of AD, 24-hour supervision is eventually required (73%), and falls can be common as the disease progresses (65%). At the same time, more than half had misconceptions that prescription drugs to prevent AD are available (56%), and people can recover from AD in rare cases (59%). Many did not know that the life expectancy of individuals with AD can be 6 to 12 years (51%) and incorrectly believed that mental exercise is a proven prevention of AD (84%).

### ***Predictors of AD knowledge***

Table 3 shows the results of multiple regression analyses. No multicollinearity was detected using variance inflation factors (VIF) and tolerance values among the predictors. For total knowledge, only having college education or higher ( $\beta=.26$ ,  $p < .01$ ) is significantly associated with greater AD knowledge ( $adj R^2 = .07$ ,  $F= 2.61$ ,  $p < .01$ ). For domain knowledge, three out of seven domain regression models turned out to be significant, and they are life impact, risk factors, and caregiving: Those who have college degree or higher ( $\beta=.17$ ,  $p < .05$ ) and have more pity ( $\beta=.26$ ,  $p < .001$ ) and less social distance ( $\beta=-.14$ ,  $p < .01$ ) stigmatic beliefs are likely to have greater knowledge about life impact ( $adj R^2 = .13$ ,  $F= 4.29$ ,  $p < .001$ ); those who have college degree or higher ( $\beta=.16$ ,  $p < .05$ ) and less pity ( $\beta=-.16$ ,  $p < .05$ ) stigmatic beliefs are likely to be more knowledgeable about risk factors ( $adj R^2 = .06$ ,  $F= 2.33$ ,  $p < .05$ ); and those who have college education or higher ( $\beta=.27$ ,  $p < .05$ ) and have more pity ( $\beta=.18$ ,  $p < .05$ ) and less antipathy ( $\beta=-.16$ ,  $p < .05$ ) stigmatic beliefs are likely to have better caregiving knowledge ( $adj R^2 = .01$ ,  $F= 3.39$ ,  $p < .001$ ).

### Discussion

The current study assessed the status of AD knowledge in KAs and identified its predictors. Findings revealed that KAs **showed 59% accuracy in their overall AD knowledge. This overall AD knowledge level is much lower than other groups/populations in U.S. studies where the same AD knowledge measure was used: 80% accuracy in older adults and 76% accuracy in dementia caregivers (Carpenter et al., 2009); 75% accuracy in Whites and 64% accuracy in Asian /Pacific Islanders (Carpenter et al., 2011); and 73% accuracy in older Chinese Americans (Sun et al., 2014).** This strongly suggests a need for **more extensive outreach** and educational efforts to increase overall AD knowledge in KA communities.

At the domain levels, KAs were most knowledgeable about assessment and diagnosis (70%) followed by life impact (67%), symptoms (61%), and treatment and management (60%) while being least knowledgeable about caregiving (48%). These findings are different from domain knowledge status of other populations in the studies where the same AD measure was used: general Americans were most knowledgeable about assessment/treatment (82%) followed by caregiving (74%) and life impact (71%) while being least knowledgeable about risk factors (62%) (Carpenter et al., 2011). Chinese American older adults were most knowledgeable about course and life impact (83%), followed by treatment (78%), caregiving (72%), and symptoms (71%) while being least knowledgeable about risk factors (61%) (Sun et al., 2014). These variations of domain knowledge by populations demonstrate that educational campaigns should emphasize different content areas depending on their target populations. Additionally, our findings about domain knowledge suggest that KAs were familiar with the disease information where scientific knowledge is solid such as symptoms, diagnosis, and treatment. They were also well aware of impact of the disease on affected individuals probably because severe/terminal stages are a commonly portrayed image of AD in the media (Gerristen et al., 2018). At the same time, they did not know much about caregiving and support for individuals with AD. Education for KAs should consider emphasizing caregiving related information because it can shape the quality of life of both care-recipients and caregivers. **Korean cultural context of expectations for caregiving, such as filial piety/obligation, should be considered when delivering caregiving related information.**

At the item levels, many KAs showed a familiarity with the term AD and recognized memory problem as an early symptom, which can be a sign that widely publicized information through mass and social media has been well transpired into the population. They had a



misconception that sudden appearance of memory trouble and confusion can be due to AD. This misconception can have a preventive function if it leads to screening and diagnosis of AD. It is also possible that the misconception can cause ignorance or misunderstanding of memory troubles and confusion experienced themselves or noticed in others given that many KAs believed that AD is a normal aging process (Lee et al., 2009; Jang et al., 2010) and forgetfulness and confusion are commonly viewed as normal in old age in AAs (Miyawaki, 2005; Wang 2012). In educational efforts for KAs, it is important to include information about differentiating simple forgetfulness and memory trouble vs. mild cognitive impairment vs. potential signs of AD so help-seeking can be initiated timely when needed. **A recent development that sudden appearance of confusion (delirium) in older adults can be caused by urinary tract infection (UTI) (Benjamin Rose Institute on Aging, 2019) should be added when explaining memory troubles and confusion so that the reversible condition can be properly diagnosed and treated accordingly.**

Items in the caregiving domain clearly showed that KAs were not prepared for potential caregiving journey. Most had significant lack of knowledge about how to handle repeated stories/questions. They also had a misconception that individuals with AD lose their independence and dignity right away. A stereotypical image of individuals with AD in the mass media as dependent, vulnerable, and burdensome can partially explain this misconception, and it can interfere authentic communication and relationship between affected individuals and family members (Gerristen et al., 2018). A person-centered approach, not disease-focused approach, needs to be considered in designing caregiving education for KAs so a sense of dignity and self-esteem of affected individuals are preserved during caregiving.

In the course-related items, many did not know a lengthy life expectancy after being diagnosed with AD and AD as a terminal condition while believing that recovery is possible in

rare cases. In other studies of KAs, 32% to 51% believed that AD is not fatal (Jang et al., 2010; Lee et al., 2009; Watari & Gatz, 2004). Not **viewing AD as a terminal condition** can be seen as optimistic because it can encourage help-seeking in the hope of recovery. Yet it is important to deliver accurate information about the progressive and terminal nature of the disease so **KAs** can prepare themselves for a potential long journey with quality and realistic expectations.

**Presenting practical information such as financial care arrangements along with the different stages of AD can be a way to promote correct understanding of AD as a continuum.**

Regarding risk factor-related items, it is encouraging that KAs were well aware of cardiovascular risk factors when other populations had poor knowledge about such controllable/modifiable risk factors (Cahill et al., 2015; Carpenter et al., 2011; Cation et al., 2018; Milani et al., 2020; Sun et al., 2014). Many incorrectly believed that medication for AD preventions are available and it can promote poorly supported preventive measures like vitamins and dietary supplements (Cations et al., 2018). Majority believed that mental exercises have scientifically proven effect for AD prevention. These beliefs fall under the gray area because mental exercise and dietary supplements can benefit older adults in many ways **although** lacking scientific evidence for AD prevention. When preparing the contents related to risk factors in educational interventions for KAs, messages about risk reductions can focus more on realistic and scientifically proven strategies along with the current scientific developments about treatment and prevention.

In regard to predictors of AD knowledge, education plays a significant role in overall AD knowledge in KAs **as found in other studies with Korean Americans (Jang et al., 2010; Park et al., 2021; Watari & Gatz, 2004), Chinese Americans (Sun et al., 2014), and White, Black and/or Hispanic older adults (Ayalon & Arean, 2004; Edward et al., 2000).** At the domain levels,

education is a significant predictor of all three significant domains, too. These findings suggest targeting individuals with less than college education could be effective to increase both overall AD knowledge and domain knowledge of life impact, risk factors, and caregiving.

Growing body of dementia stigma research showed that stigma can have negative impact on dementia-affected individuals and their families in terms of psychological well-being and quality of life (Harper et al., 2019). Yet, the role of stigmatic beliefs in AD knowledge is not much known besides that having more stigmatic beliefs such as fatalism and stigmatization of mental illness is related to limited AD knowledge (Sun et al., 2014). Our findings of effect of different domains of stigmatic beliefs on different AD knowledge domains provide valuable information that can be considered when working for stigma change. Stigmatic beliefs of pity are significantly associated with all three domains: Those having more positive emotional attributions such as concern, compassion, sympathy, and sorrow are likely to be more knowledgeable about life impact and caregiving and less knowledgeable about risk factors. It is possible that positive emotions can facilitate information seeking regarding consequences of the disease on affected individuals and how to support them while generating less attention to factual and scientific information like risk factors. These findings suggest that we can keep making effort toward promoting positive stigmatic beliefs, which can generate a desirable effect of knowledge increase in certain areas such as life impact and caregiving. Concurrently, we should be mindful that it can create an unfavorable consequence of decreasing risk factor related knowledge and emphasize correct information about risk factors.

Antipathy stigmatic beliefs are significantly related to caregiving domain: Those having less negative emotional attributions such as shame, embarrassment, disgrace, and disgust are likely to be more knowledgeable about caregiving. It can be interpreted that people can become

more attentive to information about helping affected individuals when having fewer negative emotions. The finding is encouraging because we can keep working on reducing negative stigma as it can generate a favorable consequence of knowledge increase about caregiving.

Lastly, stigmatic beliefs of social distance are significantly related to life impact domain: Those having more behavioral discrimination such as limiting social contact, avoidance, and ignorance are likely to be more knowledgeable about life impact. Possibly, having behavioral discriminatory attitudes toward individuals with AD in social relationships can evoke feeling of rejection, and it can lead to curiosity about consequences of the disease and quality of life of affected individuals. When working on decreasing behavioral discrimination toward AD-affected individuals, we should be mindful about **the** possibility of reducing knowledge about life impact and work on delivering correct message about consequences of AD.

Some limitations of the study should be noted. Our findings from cross-sectional data cannot establish causal relationships among the study variables. Use of convenience sampling method limits generalizability of the findings outside the study context. **It should be noted that cognitive screening was not conducted during recruitment of participants which included older adults.** Variances explained in the regression models are small, and future research with other potential predictors addressing personal experience and characteristics is warranted. **Future research with qualitative approach can broaden our understanding about the KA's sociocultural context of AD knowledge. Although the AD measure used in the study was validated with Koreans (Kim & Jung, 2015), further validation research is needed in the KA context.** Additional studies of assessing AD knowledge in KAs with a standardized measure **that has strong psychometric properties** is recommended so findings of KAs with various characteristics in

different geographic regions are compared and accumulated for building the knowledge base for the group.

In conclusion, the current study provides the AD knowledge status in KAs especially areas of misconceptions and knowledge gaps, which can be useful in designing educational interventions. Our findings about domain knowledge demonstrates that it is worth treating AD knowledge as multi-dimensional constructs rather than a unidimensional one. Using a standardized measure, we were able to compare our findings to those of other studies: KAs showed lower level of overall AD knowledge than other populations, and it suggests necessity for strong outreach programs to increase AD knowledge in KA community; and variations in domain knowledge between KAs and other populations demonstrate a need for tailoring contents in educational outreach and public health messages by populations. Multivariate findings helped us understand the context of AD knowledge and confirmed a crucial role of education supporting previous findings with other populations. This finding suggests a need for a targeted approach to KAs with less education for AD knowledge increase. Our study is one of the first ones that examined the role of stigma on AD knowledge. **Our findings about** significant effects of different domains of AD stigmatic beliefs on AD domain knowledge **suggest** how efforts for stigma change can be efficient for the purpose of increasing AD domain knowledge in KAs. For example, we can promote positive stigmatic beliefs to increase knowledge in life impact and caregiving; we continue to work on reducing negative stigmatic beliefs because it can increase caregiving related knowledge; and a caution is needed when trying to reduce behavioral discrimination as it can lower life impact related knowledge.

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Table 1. Characteristics of the sample (N = 268)

Characteristics	%	Mean (SD)	Actual Range	Possible Range	Scoring
Age		54.3 (10.9)	40-86	N/A*	
Female	60.7				
Married	81.4				
College degree or higher	49.1				
Household income					
<\$20,000	13.7				
\$20,000 to <\$40,000	23.6				
\$40,000 to <\$60,000	30.8				
\$60,000 to <\$80,000	9.4				
\$80,000 to <\$100,000	7.2				
\$100,000 or higher	14.7				
Exposure to AD	39.3				
Years in the U.S.		19.6 (11.1)	1-49	N/A	
English proficiency (3 items)		6.7 (1.9)	3-12	3-12	higher = more proficient
Social engagement (4 items)		16.0 (4.0)	4-14	4-24	higher = more socially engaged
Sources and frequency of getting health-related info (13 items)		33.0 (7.8)	16-65	13-65	higher = more sources & more frequently
Stigmatic beliefs					
Pity (6 items)		19.9 (6.9)	6-30	6-30	higher = greater stigma
Antipathy (4 items)		8.9 (4.0)	4-19	4-20	higher = greater stigma
Social distance (6 items)		17.6 (5.8)	6-30	6-30	higher = greater stigma

Notes: The sample size for each variable varies from 264 to 268; \*N/A = not applicable

Table 2. Alzheimer's disease knowledge in Korean Americans (N = 268)

	Correct answer	Item % correct	% accuracy	Mean (SD)	Range
<b>Total knowledge</b>			59.0	17.7 (2.7)	9-24
<b>Domain knowledge</b>					
<b><i>Assessment &amp; Diagnosis</i></b>			70.3	2.8 (0.8)	1-4
When a person with AD becomes agitated, a medical examination might reveal other health problems that caused the agitation.	True	94.0			
AD is one type of dementia.	True	86.6			
Symptoms of severe depression can be mistaken for symptoms of AD.	True	66.7			
If trouble with memory and confused thinking appears suddenly, it is likely due to AD.	False	34.1			
<b><i>Life Impact</i></b>			67.0	2.0 (0.8)	0-3
People with AD are particularly prone to depression.	True	81.9			
It is safe for people with Alzheimer's disease (AD) to drive, as long as they have a companion in the car at all times.	False	65.7			
Most people with AD live in nursing homes.	False	53.9			
<b><i>Symptoms</i></b>			60.5	2.4 (1.0)	0-4
Trouble handling money or paying bills is a common early symptom of AD.	True	71.2			
Most people with AD remember recent events better than things that happened in the past.	False	61.8			
One symptom that can occur with AD is believing that other people are stealing one's things.	True	59.5			
Tremor or shaking of the hands or arms is a common symptom in people with AD.	False	50.9			
<b><i>Treatment &amp; Management</i></b>			60.3	2.4 (0.8)	0-4

People whose AD is not yet severe can benefit from psychotherapy for depression and anxiety.	True	85.3			
Poor nutrition can make the symptoms of AD worse.	True	75.8			
AD cannot be cured.	True	62.2			
When a person has AD, using reminder notes is a crutch that can contribute to decline.	False	17.2			
<b>Risk Factors</b>			56.8	3.4 (1.1)	0-6
People in their 30s can have AD.	True	88.0			
Genes can only partially account for the development of AD.	True	73.3			
Having high blood pressure may increase a person's risk of developing AD.	True	60.2			
Having high cholesterol may increase a person's risk of developing AD.	True	58.9			
Prescription drugs that prevent AD are available	False	44.3			
It has been scientifically proven that mental exercise can prevent a person from getting AD.	False	15.8			
<b>Course</b>			57.0	2.3 (1.0)	0-4
Eventually, a person with AD will need 24-hr supervision.	True	72.8			
A person with AD becomes increasingly likely to fall down as the disease gets worse.	True	64.5			
After symptoms of AD appear, the average life expectancy is 6–12 years.	True	49.2			
In rare cases, people have recovered from Alzheimer's disease.	False	41.2			
<b>Caregiving</b>			48.4	2.4 (0.9)	0-4
If a person with AD 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	87.2			
People with AD do best with simple instructions giving one step at a time.	True	80.5			

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When people with AD repeat the same question or story several times, it is helpful to remind them that they are repeating themselves.	False	38.1
Once people have AD, they are no longer capable of making informed decisions about their own care.	False	32.5
When people with AD begin to have difficulty taking care of themselves, caregivers should take over right away.	False	4.1

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Note: The sample size for each item varies from 259 to 268.

Table 3. Predictors of Alzheimer's disease knowledge in Korean Americans (N=205)

	Total knowledge		Domain knowledge					
	$\beta$	$t$	Life impact		Risk factor		Caregiving	
	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$	$\beta$	$t$
Age	.04	.48	.11	1.53	-.00	-.05	-.06	-.83
Female	-.05	-.67	.04	.54	-.12	-1.70	.12	1.73
College education or above	.26	3.06**	.17	2.12*	.16	1.98*	.27	3.48*
English proficiency	.10	1.22	.13	1.73	.08	.49	.04	.46
Exposure to AD	.05	.70	-.10	-1.41	.03	.93	.02	.32
Social engagement	-.06	-.80	-.04	-.62	-.01	-1.21	-.04	-.66
Sources/frequency of getting health-related info	-.04	-.61	-.03	-.43	.01	.17	-.03	-.39
Stigmatic beliefs								
Pity (positive emotions)	.06	.74	.26	3.64***	-.16	-2.19*	.18	2.56*
Antipathy (negative emotions)	-.07	-.90	-.03	-.40	-.02	-.32	-.16	-2.17*
Social distance (behavioral discrimination)	-.08	-1.05	-.14	-2.08*	.01	.08	-.00	-.03
<i>adj R</i> <sup>2</sup>	.07**		.13***		.06*		.01***	

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$



