A cross-sectional study on the knowledge of pharmacists about Alzheimer's Disease: enhancing services for patients and caregivers

Enes ZEYBEK[1], Muhammed Yunus BEKTAY[1*]

1 Clinical Pharmacy Department, Faculty of Pharmacy, Bezmialem Vakif University, Istanbul, Türkiye

ABSTRACT

Alzheimer's disease (AD) is a progressive neurodegenerative disorder impacting cognitive function and daily activities. Pharmacists' accessibility enables them to contribute to rational drug use, monitor interactions, and educate patients and caregivers, improving health outcomes. This study investigates pharmacists' knowledge of AD. A descriptive study in Türkiye utilized a web-based questionnaire with demographic questions and the Alzheimer's Disease Knowledge Scale (ADKS). 185 participants (72.43% female, mean age 36.9±11.9) exhibited significant knowledge of Alzheimer's disease (mean ADKS score: 7.48±1.18). Scores varied across factors like gender, age groups, professional experience, and geographical region. Statistically significant correlations were found between these factors and specific domains of AD knowledge. AD necessitates specialized care, and pharmacists' services improve health outcomes for patients and families. Cognitive pharmacy services for complex treatment regimens benefit AD patients and their relatives. A multidisciplinary approach is crucial in effectively addressing the impact of AD and providing optimal treatment.

Keywords: Alzheimer's disease, pharmacists, knowledge, ADKS, dementia

INTRODUCTION

Alzheimer's disease (AD), a neurodegenerative condition, is characterized by progressive deterioration of the brain over time. Dementia encompasses a range of specific symptoms, including memory and language decline, difficulties

with problem-solving, and significant impact on daily functioning. While various factors can contribute to the development of dementia, AD is the prevailing form within this category [1,2]. The underlying cause of these symptoms is attributed to the impairment or destruction of neurons responsible for cognitive functions, including thinking, learning, and memory [2]. Due to the progressive nature of AD, the pathological changes extend to neurons in various regions of the brain. Consequently, individuals experience significant impairment in their ability to perform basic physical activities, such as walking and swallowing. In the advanced stages of AD, individuals typically become bedridden and require constant care and assistance throughout the day [1,2].

Pharmacists are readily accessible healthcare professionals, and as a result, many patients seek their assistance at pharmacies with the expectation of resolving their health concerns. Pharmacists have the capacity to contribute to multidisciplinary healthcare by promoting rational drug use, monitoring drug-drug interactions, and closely monitoring the adverse effects of medications [3–7]. A pharmacist possesses the ability to monitor the evolving symptoms in elderly patients, identify individuals at risk, and educate caregivers about the disease and available treatment options. By providing these comprehensive services, pharmacists not only enhance the overall health outcomes of AD patients but also contribute to the well-being of their caregivers, while promoting rational drug utilization [8–10]. Pharmacists have the capability to provide specialized monitoring and follow-up for patients with Alzheimer's disease, including the observation of specific signs and symptoms, assessment for early detection of Alzheimer's symptoms, identification of individuals who may be at risk, and the provision of education to both patients and their family members [9,11]. The aim of this study is to investigate pharmacists' knowledge about AD.

METHODOLOGY

Design, Sample Size and Participants

A descriptive, observational study was conducted in Türkiye between November 2020 and February 2021. Participants were limited to pharmacists who expressed their willingness to participate in the study. The study received ethical approval from the Bezmialem Vakif University local Ethics Committee, with a decision number of 18/346. The exponential non-discriminative snowball sampling method was utilized to select participants. The study adheres to the CROSS (A Consensus-Based Checklist for Reporting of Survey Studies) standards for reporting [12].

$$n = \frac{Z^2 \, p(1-p)}{d2}$$

The formula described above is utilized to determine the sample size required for the study. In the formula, the variable "n" denotes the sample size, while a p-value of 0.2 is used to represent the proportion. A margin of error of 0.05 is set for sampling, and "Z" represents the standard normal value at a 95% confidence interval, which is equal to 1.96. Based on these parameters, the formula is employed to compute the sample size, resulting in a value of 245. However, for the final analyses, only 185 participants were included, as depicted in Figure 1. The study included participants who were pharmacists and individuals who voluntarily provided their consent by signing the consent form. Exclusions from the study comprised non-pharmacists who declined to participate, pharmacy faculty students, and individuals who lacked the required cognitive abilities.
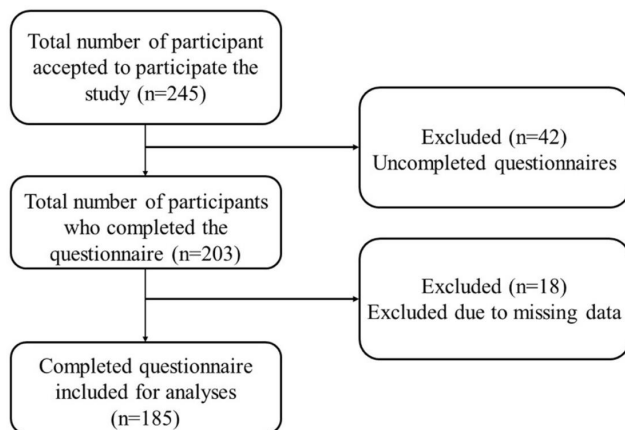

Figure 1. Flowchart CROSS guideline requirements

Questionnaire development

To assess the level of AD knowledge among participants, a web-based questionnaire was developed using Google Forms. The questionnaire was disseminated through various channels, including email, direct messages, and social media platforms, along with information about the study. To encourage participation, participants were encouraged to share the questionnaire link with their social networks. The questionnaire was divided into two sections with 16 items in total, the first focusing on demographics (age, gender, educational level, years of work experience, province), while the second section comprised the Alzheimer's Disease Knowledge Scale (ADKS). Participants were required

to provide an electronic approval as part of the written consent form, and each response was cross-checked to ensure no duplicate entries were made. Additionally, a hyperlink to the consent form was embedded in the online questionnaire for participants to access for personal reference. The option to fill out the Google form once was enabled.

ADKS as prepared with modifications of questionnaire prepared and validated by carpenter [13]. Yilmaz and Çolak 2019 conducted cross-cultural adaptation and assessed the validity and reliability of the Turkish version of the ADKS questionnaire[14]. The Turkish validation of the questionnaire modified by authors and the number of items has been reduced. The modified ADKS questionnaire is a self-administered survey that encompasses five subdomains. It comprises a total of ten items that require participants to select either "Yes" or "No" as their answer. Only one answer can be chosen per inquiry, and each correct response is assigned a score of one (1), while incorrect responses are assigned a score of zero (0). The participant's survey score can range from a minimum of zero (0) to a maximum of ten (10) points. The five domains of the modified ADKS questionnaire are as follows: risk factors (1 item), assessment and diagnosis (1 item), symptoms (2 item), life impact (1 item), treatment and management (5 item).

The questionnaires underwent a process of bilingual translation from English to Turkish, which included both forward and backward translation. The structured items within the questionnaires were carefully evaluated to ensure that they were appropriately rephrased, reformatted, and deemed relevant for use. A team of experts consisting of four professionals was consulted to provide feedback on the questionnaire's language design and the questions were revised based on their recommendations. Additionally, the questionnaire was pre-tested with two professionals who possess expertise in the related field. The pre-testing involved retrospective cognitive interviews with a focus on assessing the content, format, and wording of the questionnaire. Pilot research was conducted with a group of fifteen individuals who did not participate in the initial evaluation, and feedback obtained was used to improve the questionnaire's clarity and understandability. A group of twenty participants, who were not included in the original study data set, were asked to complete the questionnaire within a period of two weeks. The questionnaire takes approximately 5 to 10 minutes to complete and is designed for use with pharmacists.

To assess the test-retest reliability of the questionnaire, the Spearman correlation coefficient, Wilcoxon test, and intraclass correlation coefficient (ICC) were evaluated using a sample of 20 participants. The results indicated that

the questionnaire exhibited a statistically insignificant correlation of 0.723 (p>0.05) and an ICC of 0.718 (95%GA: 0.593-0.865, F: 4.39, p<0.001). The reliability of the ADKS scale was evaluated using Kuder-Richardson's formula, which yielded a value of 0.872 for the questionnaire tool used in this study.

Statistical Analysis

As descriptive statistics, mean, median, standard deviation, and interquartile range [IQR] or count and percentages are given for continuous variables. The frequency and percentage are given for categorical variables. The Kolmogorov-Smirnov, Shapiro-Wilk tests Q-Q plots, histogram and density analysis, skewness and kurtosis values was used to test for normality of continuous variables. The statistical analysis of the data was performed using SPSS version 26 and Jamovi software. The mean and standard deviation of the total score on the ADKS was calculated and then the difficulty and discrimination indexes were calculated for each item. The total score of the ADKS was determined by adding up the correct responses. The difficulty index (p) was calculated to show the percentage of people who answered the item correctly. The discrimination index (DI) was estimated (ideally between 0.3 and 0.7) to measure how well the items discriminated between people with high and low scores and was calculated by subtracting the number of correctly answered items from low scorers from the number of correctly answered items from high scorers, divided by the number of people in the sample. The internal consistency of the ADKS was determined using Kuder-Richardson's formula for items scored dichotomously.

RESULTS and DISCUSSION

A total of 245 participants were enrolled in the study, but 42 were excluded due to incomplete questionnaires, and an additional 18 were excluded due to missing data. The study's flowchart is depicted in Figure 1. Out of the initial 245 participants, a final analysis was conducted using 185 questionnaires. Table 1 provides an overview of the demographic characteristics of the study participants. Predominantly, the majority of participants were female (134, 72.43%), and the mean age of participants was 36.9 ± 11.9. Approximately one-third of the respondents are located in the Marmara region (54, 29.67%). This finding aligns with Türkiye's population density, supporting the outcomes of our study. Subsequently, the Central Anatolia region emerges as the second most prevalent geographical area where the participants reside (43, 23.63%). When examining the professional experience of the questionnaire participants, it becomes evident that there is a relatively balanced distribution. Out of the total

185 participants, 93 (50,27%) individuals had less than 10 years of professional experience, whereas 52 (28.11%) participants were pharmacists with over 20 years of professional experience.

The present study involved the participation of 185 pharmacists, and its primary objective was to assess the level of knowledge pertaining to AD using the ADKS. A multidisciplinary approach in AD care is recommended in many different studies in the literature. Pharmacist could take active part in multidisciplinary care teams by providing cognitive pharmacy services. The most important patient-oriented services that can be provided by pharmacists in free pharmacies are detailed drug examination, patient education, referral for early diagnosis and psychosocial support [15-20].

Table 1. Demographic characteristics of the study participants

Gender (n, %)	n=185
Male	51 (27.57%)
Female	134 (72.43%)
Age (Mean± SD)	**36.9 ± 11.9**
21 - 30	66 (35.68%)
31 - 50	85 (45.95%)
>51	34 (18.38%)
Years of work experience (Mean±SD)	**14.4±12.6**
0-5	60 (32.43%)
6-10	33 (17.84%)
11-20	40 (21.62%)
20+	52 (28.11%)
Region (n, %)	
Marmara	54 (29.67%)
Central Anatolia	43 (23.63%)
Aegean	29 (15.93%)
Black Sea	19 (10.44%)
Mediterranean	15 (8.24%)
Eastern Anatolia	14 (7.57%)
Southeastern Anatolia	11 (6.04%)

The responses provided by the pharmacists who took part in our study, as indicated by the ADKS questionnaire, demonstrated a significant level of knowledge regarding AD. the frequencies of participants' responses to the ADKS Items and Domains is given in Table 2. The mean ADKS score, reflecting the participants' knowledge, was calculated as 7.48±1.13 (Table 3). The participants demonstrated a notable level of accuracy in responding to the survey items, with three specific items garnering the highest number of correct answers. These items, respectively, are, *"Acetylcholinesterase inhibitors are effective in early to moderate stages of Alzheimer's Disease"* which received 177 correct responses (95.67%), *"Memantine is effective in moderate to severe Alzheimer's Disease"* with 174 correct responses (94.05%), and "*Patients with Alzheimer's are prone to depression*" which received 171 correct responses (92.43%). On the other hand, participants displayed a notable number of incorrect responses for three specific questions. These questions, respectively, are, *"It is proven that mental exercise can prevent a person from developing Alzheimer's Disease"* which received 172 incorrect responses (92.97%); "*It is highly recommended to use Benzodiazepines in Alzheimer's Disease patients who have also developed anxiety*" with 115 incorrect responses (62.16%), and *"Decline in cognitive functions will continue in patients with Alzheimer's after initiation of drug therapy"* which garnered 65 incorrect responses (35.14%). Mean ADKS rate of knowledge of AD among participants is given in Table 3. The participants' mean scores on the 5 domains of the modified ADKS questionnaire were as follows, Assessment and Diagnosis (0.89 ± 0.31, [1 item]), Symptoms (0.75 ± 0.44, [1 item]), Risk factors (1.59 ± 0.55, [2 items]), Life impact (0.93 ± 0.26 [1 item]), and Treatment and Management (3.74 ± 0.89 [5 items]).

Table 2. ADKS rate of knowledge of Alzheimer's disease among participants

ADKS Items and Domains	Correct Answers (n, %)	Wrong Answers (n, %)
Assessment and Diagnosis		
Alzheimer's is a type of Dementia	163 (88.11%)	22 (11.89%)
Symptoms		
Tremor and shaking hands or arms is a common symptom for Alzheimer's Disease	138 (74,59%)	47 (25,41%)
Risk factors		
High cholesterol and blood pressure levels increase the chances for an individual to develop Alzheimer's Disease	123 (66.49%)	62 (33.51%)
It is proven that mental exercise can prevent a person from developing Alzheimer's Disease	13 (7.03%)	172 (92.97%)
Life impact		
Patients with Alzheimer's Disease are prone to depression	171 (92.43%)	14 (7,57%)
Treatment and Management		
Acetylcholine esterase inhibitors are effective in early to moderate stages of Alzheimer's Disease	177 (95.67%)	8 (4.32%)
The side effects of Acetylcholine esterase inhibitors are Diarrhea, Nausea, Vomiting and Bradycardia	151 (81.62%)	34 (18.38%)
It is highly recommended to use Benzodiazepines in Alzheimer's patients who has also developed anxiety.	70 (37.38%)	115(62.16%)
Memantine is effective in moderate to severe Alzheimer's Disease	174 (94.05%)	11 (5,95%)
Decline in cognitive functions will continue in patients with Alzheimer's Disease after initiation of drug therapy	120 (65.86%)	65 (35.14%)

In order to improve the quality of services to be provided by pharmacists to AD patients, increasing the level of knowledge of community pharmacists about AD has been found useful in the literature in terms of early diagnosis, proper management of disease symptoms and improving the quality of life [21]. According to our results, Turkish pharmacists ADKS score was 7.48±1.13 which was equivalent of 74.8%. Based on existing literature, it is evident that the level of knowledge regarding AD among Turkish pharmacists is comparable to findings reported in similar studies [16,22–25]. Turkish pharmacists exhibited superior performance compared to a study conducted by Mat Nuri et al. in Malay-

sia [24]. However, Spanish pharmacists outperformed Turkish pharmacists, as evidenced by a study conducted by Alacreu et al. in Spain [23]. Furthermore, in a study conducted by Nordhus et al. in Norway involving psychologists, Turkish pharmacists demonstrated higher levels of proficiency compared to the psychologists in Norway [22].

Table 3. Mean ADKS rate of knowledge of Alzheimer's disease among participants

ADKS domains	Mean ADKS	SD
Total domains score	7.48	1.13
Assessment and Diagnosis	0.89	0.31
Symptoms	0.75	0.44
Risk factors	1.59	0.55
Life impact	0.93	0.26
Treatment and Management	3.74	0.89

According to our results, Turkish pharmacists received the highest score in the Treatment and Management domain (3.74±0.89, 93.52% correct). On the other hand, the lowest score was recorded in the Symptoms subdomain (0.75±0.44, 74.59% correct). These results are higher than the results obtained by Mat Nuri et al. in both domains [24]. In contrast, our study yielded a higher score in the Treatment and Management subheading when compared to the findings reported by Mónica Alacreu et al. [23]. However, Turkish pharmacists exhibited lower success rates in the Symptoms subheading compared to their Spanish colleagues. Existing literature indicates that Turkish pharmacists often seek counseling from their patients, as independent pharmacists serve as one of the readily accessible components of the healthcare system [26].

Table 4. Comparison of demographic data with ADKS Questionnaires scores among participants

	ADKS (Mean± SD)	Assessment and Diagnosis	Symptoms	Risk factors	Life impact	Treatment and Management	p
Gender (Mean± SD)							
Male	7.32 ± 1.27	0.84±0.36	0.70±0.46	1.13±0.50	0.88±0.32	2.07±1.74	>0.05*
Female	7.54 ± 1.07	0.91±0.29	0.76±0.43	1.04±0.51	0.95±0.22	1.71±1.39	
Age (Mean± SD)							
21 – 30	7.50 ± 1.17	0.86±0.35	0.61±0.49	1.11±0.29	0.95±0.29	2.04±1.61	<0.05#
31 – 50	7.56 ± 1.07	0.88±0.32	0.82±0.38	0.96±0.21	0.91±0.21	1.42±1.32	
>51	7.21 ± 1.21	0.94±0.24	0.82±0.39	1.22±0.28	0.91±0.29	2.31±1.51	
Years of work experience (Mean± SD)							
0-5	7.52 ± 1.17	0.90±0.30	0.63±0.48	1.13±0.55	0.88±0.32	2.04±1.63	<0.05#
6-10	7.55 ± 1.09	0.87±0.33	0.82±0.40	1.02±0.42	0.97±0.17	1.25±1.12	
11-20	7.62 ± 1.18	0.83±0.38	0.73±0.45	0.96±0.41	0.95±0.22	1.41±1.31	
20+	7.28 ± 1.08	0.92±0.27	0.85±0.36	1.11±0.57	0.94±0.23	2.20±1.54	
Region (Mean± SD)							
Marmara	7.62 ± 1.08	0.89±0.31	0.74±0.49	1.13±0.49	0.94±0.25	2.19±1.58	>0.05#
Central Anatolia	7.51 ± 1.03	0.86±0.35	0.70±0.55	1.05±0.55	0.97±0.315	1.76±1.47	
Aegean	7.25 ± 1.33	0.86±0.35	0.80±0.55	1.00±0.31	0.90±0.31	1.45±1.6	
Black Sea	7.47 ± 1.37	0.89±0.32	0.84±0.54	1.11±0.54	1.00±0.33	2.01±1.66	
Mediterranean	7.60 ± 0.91	0.94±0.25	0.69±0.43	0.87±0.42	1.00±0.30	1.37±1.36	
Eastern Anatolia	7.27 ± 1.42	0.91±0.30	0.73±0.20	0.91±0.47	0.73±0.46	1.25±1.15	
Southeastern Anatolia	7.11 ± 0.93	0.90±0.32	0.80±0.58	1.35±0.48	0.70±0.48	1.78±1.61	

*Mann-Whitney U test

#Kruskal-Wallis test

Another potential factor contributing to the higher results we obtained compared to the existing literature is the frequent utilization of free pharmacies in Türkiye for consultation by the population. Considering the demographic characteristics of Turkish society, it is apparent that individuals requiring long-term care are predominantly supported by their family members rather than being placed in nursing homes could be attained as another contributing factor. This can be attributed to the extensive experience of Turkish pharmacists in interacting not only with AD patients but also with their caregivers, including family members.

Upon comparing the mean ADKS scores across various factors such as gender, age groups, professional experience, and geographical region, it was observed that the highest scores were obtained by women (7.54 ± 1.07), individuals aged between 31-50 years (7.56 ± 1.07), those with professional experience ranging from 11-20 years (7.62 ± 1.18), and participants residing in the Marmara region (7.62 ± 1.08), respectively (Table 4). In terms of mean scores, female participants exhibited higher performance in the Assessment and Diagnosis domain (0.91 ± 0.29), Symptoms domain (0.76 ± 0.43), and Life impact domain (0.95 ± 0.22). On the other hand, male participants demonstrated greater proficiency in the Risk factors domain (1.13 ± 0.50) and Treatment and Management domain (2.07 ± 1.74) (Table 4).

When examining the ADKS domains across different age groups, participants aged 21-30 years attained the highest mean scores in the Life impact domain (0.95 ± 0.29), while those aged 31-50 years achieved the highest mean scores in the Symptoms domain (0.82 ± 0.38). Pharmacists aged 51 years and above demonstrated the highest mean scores in the Assessment and Diagnosis domain (0.94 ± 0.24), Risk factors domain (1.22 ± 0.28), and Treatment and Management domain (2.31 ± 1.51) (Table 4).

Unlike Mat Nuri, Zerafa, Scerri and Smyth et al., elder pharmacists with higher professional experience obtained higher scores in our sample [21,24,27]. In addition, a statistically significant correlation was found between increasing age and professional experience and symptom domain score (r:0.215, $p<0.005$ and r: 0.169, $p < 0.022$ respectively). In addition, pharmacist in charge had better score in comparison to other professional roles within the pharmacy and a statistically significant correlation has been obtained between professional role within the pharmacy, and the Symptoms domain. This observation can be attributed to the increasing number of encountered AD patients with advancing professional experience, as well as the continuous professional education offered by Turkish pharmacy authorities.

In terms of geographical regions, notable variations were observed. Participants residing in the Mediterranean region achieved the highest average score (0.94 ± 0.25) in the Assessment and Diagnosis domain. The Black Sea region attained the highest average score (0.84 ± 0.54) in the Symptoms domain. The Southeast Anatolia region obtained the highest average score (1.35 ± 0.48) in the Risk Factor domain. The Mediterranean region also secured the highest average score (1.00 ± 0.30) in the Life Impact domain. Lastly, the Marmara region obtained the highest average score (2.19 ± 1.58) in the Treatment and Management domain (Table 4).

Upon evaluating the ADKS scores of participants from various regions, it is evident that pharmacists in the Marmara region achieved the highest scores. It is hypothesized that the higher ADKS scores among independent pharmacists in the Marmara region may be attributed to factors such as enhanced accessibility to information and the region's high population density. The Marmara region's relatively smaller geographical area, coupled with its higher population density in comparison to other regions, potentially contributes to a greater number of AD patients being served by pharmacists in this area. This, in turn, may result in an elevated level of knowledge and experience regarding AD among pharmacists in the Marmara region. In addition, the presence of a significant number of pharmacy faculties in the Marmara region contributes to a higher frequency of continuing professional development opportunities available for pharmacists.

A statistically significant correlation was identified between professional experience and gender, professional role within the pharmacy, and the Symptoms domain (Spearman's rho: 0.175, $p < 0.017$; -0.591, $p < 0.001$; and 0.169, $p < 0.022$, respectively). Furthermore, a statistically significant correlation was observed between age groups and the Symptoms domain (Spearman's rho: 0.215, $p < 0.05$). Additionally, a statistically significant correlation was detected between geographical region and the Treatment and Management domain (Spearman's rho: -0.199, $p < 0.005$). Lastly, a statistically significant correlation was found between the Risk Factor and Treatment and Management domains (Spearman's rho: 0.463, $p < 0.001$).

This study has certain limitations that should be acknowledged. It is possible that some participants may have consulted external sources while responding to the questionnaire, introducing potential bias. Moreover, the assessment did not include an evaluation of participants' prior education and personal experiences related to AD (e.g., having a family member with AD), which could potentially influence the ADKS scores. While it would have been beneficial to

include a greater number of items for each domain, such an approach could have extended the completion time of the questionnaire, potentially reducing participant acceptability. Additionally, it is important to note that this study was conducted on a relatively small sample size therefore the generalizability of the findings to all pharmacists in Türkiye is limited.

AD is a progressive neurodegenerative condition characterized by an increasing prevalence worldwide, primarily affecting older individuals. The clinical manifestations of AD necessitate heightened care and have a direct impact on individuals and their families. Embracing a multidisciplinary approach is crucial in mitigating the detrimental effects of the disease, particularly in terms of treatment. Pharmacists, as healthcare professionals, possess the potential to make a significant contribution to the management of AD by providing specialized pharmacy services to both AD patients and their families. Cognitive pharmacy services, specifically designed for patients with complex treatment regimens and their relatives, contribute to the promotion of positive health outcomes.

STATEMENT OF ETHICS

CONFLICT OF INTEREST STATEMENT

The authors affirm that the research was carried out without any affiliations or financial associations that could be perceived as a possible conflict of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: EZ and MYB; methodology: EZ and MYB; formal analysis and investigation: EZ and MYB; writing-original draft preparation: EZ and MYB; writing-review and editing: EZ and MYB; resources: EZ and MYB; supervision: EZ and MYB.

FUNDING SOURCES

ACKNOWLEDGMENTS

REFERENCES

1. 2020 Alzheimer's disease facts and figures. Alzheimer's Dement, 2020. doi:10.1002/alz.12068.

2. Soria Lopez JA, González HM, Léger GC. Alzheimer's disease. Handb Clin Neurol, 2019;167:231–255. doi: 10.1016/B978-0-12-804766-8.00013-3

3. Nguyen TA, Gilmartin-Thomas J, Tan ECK, Kalisch-Ellett L, Eshetie T, Gillam M et al. The impact of pharmacist interventions on quality use of medicines, quality of life, and health outcomes in people with dementia and/or cognitive impairment: A systematic review. J Alzheimer's Dis, 2019. doi:10.3233/JAD-190162.

4. Smith VM. Interaction between community pharmacists and community nurses in dementia care. Nurs Older People, 2016;28(3):33–37. doi: 10.7748/nop.28.3.33.s25

5. Walsh KA, O'Riordan D, Kearney PM, Timmons S, Byrne S. Improving the appropriateness of prescribing in older patients: a systematic review and meta-analysis of pharmacists' interventions in secondary care. Age Ageing, 2016;45(2):201–209. doi: 10.1093/ageing/afv190

6. Nanaumi Y, Onda M, Tsubota K, Tanaka R, Mukai Y, Matoba S et al. Effectiveness of pharmacists' comprehensive assessment of medication profiles in dementia patients. Yakugaku Zasshi, 2015;135(9):1057–1067. doi: 10.1248/yakushi.15-00109

7. Galvin JE, Aisen P, Langbaum JB, Rodriguez E, Sabbagh M, Stefanacci R et al. Early stages of alzheimer's disease: Evolving the care team for optimal patient management. Front Neurol, 2021;11:1-8. doi: 10.3389/fneur.2020.592302

8. Skelton JB. White paper on expanding the role of pharmacists in caring for individuals with Alzheimer's disease: APhA foundation coordinating council to improve collaboration in supporting patients with Alzheimer's disease. J Am Pharm Assoc, 2008;48(6):715–721. doi: 10.1331/JAPhA.2008.08144

9. Marasco R, Heely JA, Gardner M. The pharmacist's role in managing patients with Alzheimer's disease. JAPhA, 2003;43(5).

10. Riachi M. How pharmacists can help their dementia patients. Can Pharm J, 2016:149(2):67–69. doi:10.1177/1715163516628795.

11. Carcak Yilmaz N, Altuntas M, Akyel YK, Uydes Dogan BS. Pharmacist's role in pharmacotherapeutic management of alzheimer's disease. Istanbul J Pharm, 2017;47(1):1–4. doi: 10.5152/IstanbulJPharm.2017.001

12. Sharma A, Minh Duc NT, Luu Lam Thang T, Nam NH, Ng SJ, Abbas KS et al. A Consensus-based checklist for reporting of survey studies (CROSS). J Gen Intern Med, 2021;36(10):3179–3187. doi: 10.1007/s11606-021-06737-1

13. Carpenter BD, Balsis S, Otilingam PG, Hanson PK, Gatz M. The Alzheimer's disease knowledge scale: development and psychometric properties. Gerontologist, 2009;49(2):236–247. doi: 10.1093/geront/gnp023

14. Yilmaz F, Yavuz Colak M. The validity and reliability of a Turkish version of the Alzheimer's disease knowledge scale (ADKS). Turkiye Klin J Heal Sci, 2020;5(3):594–602. doi: 10.5336/healthsci.2020-74195

15. Mendez MF, Melrose RA, Feil DG, Holiday KA, Hunt M, Jazi AN et al. A transdisciplinary program for care of veterans with neurocognitive disorders. Fed Pract, 2023;40(2):1–6. doi: 10.12788/fp.0343

16. Al-Taie A, Yilmaz ZK, Dahman H, Yardimci T. Insights into disease and pharmacotherapy

knowledge of Alzheimer's disease among community pharmacists: a cross-sectional study. Curr Med Res Opin, 2022;38(12):2209–2217. doi: 10.1080/03007995.2022.2129802

17. Gokce M, Bektay MY, Selvitop R, Toprak A, Yildiz GB. Investigation of the effects of biochemical parameters on Alzheimer ' s disease. Am J Alzheimer's Dis Other Dementias, 2019;34(7-8):464–468. doi : 10.1177/1533317519862108

18. Marvanova M, Henkel P. Development and assessment of targeted, live, and ınteractive continuing pharmacy education workshops in dementia care for North Dakota pharmacists. Sr care Pharm, 2023;38(3):95–104. doi: 10.4140/TCP.n.2023.95

19. Galvin JE, Aisen P, Langbaum JB, Rodriguez E, Sabbagh M, Stefanacci R et al. Early stages of Alzheimer's disease: evolving the care team for optimal patient management. Front Neurol, 2020;11:592302. doi: 10.3389/fneur.2020.592302

20. Bektay MY, Gokce M, Selvitop R, Bolat E, Yildiz GB. Investigation of the effects of polypharmacy on cognitive functions: Cohort study. Indian J Pharm Educ Res, 2021;55(1):312–317. doi: 10.5530/ijper.55.1s.64

21. Zerafa N, Scerri C. Knowledge and pharmacological management of Alzheimer's disease by managing community pharmacists: a nationwide study. Int J Clin Pharm, 2016;38(6):1416–1424. doi: 10.1007/s11096-016-0380-8

22. Nordhus IH, Sivertsen B, Pallesen S. Knowledge about Alzheimer's disease among Norwegian psychologists: The Alzheimer's disease knowledge scale. Aging Ment Heal, 2012;16(4):521-528. doi:10.1080/13607863.2011.628973.

23. Alacreu M, Pardo J, Azorín M, Climent MT, Gasull V, Moreno L. Importance of increasing modifiable risk factors knowledge on Alzheimer's disease among community pharmacists and general practitioners in Spain. Front Pharmacol, 2019;10. doi:10.3389/fphar.2019.00860.

24. Mat Nuri TH, Hong YH, Ming LC, Mohd Joffry S, Othman MF, Neoh CF. Knowledge on Alzheimer's disease among public hospitals and health clinics pharmacists in the state of Selangor, Malaysia. Front Pharmacol, 2017;8:739. doi: 10.3233/JAD-190162

25. Stearns J, Burgoon R, Sahadak Z, Alazar B, Eng ML. A comparison of the knowledge of Alzheimer's disease among community pharmacists based on regional practice setting using the Alzheimer's disease knowledge scale (ADKS). Inov Pharm, 2021;12(3). doi:10.24926/iip.v12i3.2396.

26. Okuyan B, Bektay MY, Kingir ZB, Save D, Sancar M. Community pharmacy cognitive services during the COVID-19 pandemic: A descriptive study of practices, precautions taken, perceived enablers and barriers and burnout. Int J Clin Pract. 2021;75(12):e14834. doi: 10.1111/ijcp.14834

27. Smyth W, Fielding E, Beattie E, Gardner A, Moyle W, Franklin S et al. A survey-based study of knowledge of Alzheimer's disease among health care staff. BMC Geriatr, 2013;13:2. doi: 10.1186/1471-2318-13-2