

Examination the relationship between the health literacy of patients with type 2 diabetes and the use of complementary and alternative medicine

İlknur Özkan¹, Seçil Taylan², Nermin Eroğlu³

1. Akdeniz University, Kumluca Faculty of Health Sciences, Internal Medicine Nursing Department, Kumluca-Antalya/Turkey.
2. Akdeniz University, Kumluca Faculty of Health Sciences, Surgical Nursing Department, Kumluca-Antalya/Turkey.
3. Fenerbahçe University, Faculty of Health Sciences, Istanbul.

Abstract

Background: Health literacy and the use of complementary and alternative medicine are two important factors that should be evaluated the management of type 2 diabetes.

Objectives: To examine the relationship between the health literacy of patients with type 2 diabetes and the use of complementary and alternative medicine.

Methods: This cross-sectional study was carried out with 1076 patients with type 2 diabetes. The data were collected using a descriptive information form and the Health Literacy Scale.

Results: It was found that 61.4% of the patients used complementary and alternative treatments. Patients' total score from the Health Literacy scale was 48.90 ± 19.92 . The use of complementary and alternative therapy increased in the presence of another chronic disease or diabetic neuropathy and decreased with increased age and health literacy ($R^2 = 0.50$; Model: $x^2 = 40.656$, $p = 0.00$).

Conclusions: It was determined that the health literacy of patients with type 2 diabetes was not enough and that the use of complementary and alternative treatments was high. With the increase in patients' health literacy, the use of complementary and alternative medicine decreased. It is recommended that health professionals evaluate patients' health literacy and use of complementary and alternative therapies and provide counselling to ensure effective diabetes self-management.

Keywords: Health literacy; complementary and alternative medicine; type 2 diabetes mellitus.

DOI: <https://dx.doi.org/10.4314/ahs.v23i2.60>

Cite as: Özkan İ, Taylan S, Eroğlu N. Examination the relationship between the health literacy of patients with type 2 diabetes and the use of complementary and alternative medicine. *Afri Health Sci.* 2023;23(2):519-29. <https://dx.doi.org/10.4314/ahs.v23i2.60>

Introduction

With its ever-increasing prevalence worldwide, type 2 Diabetes Mellitus (T2DM) is an important public health problem that causes morbidity and early mortality by affecting the functional capacities and quality of life of individuals.¹ It is known that an estimated 462 million people, which accounts for 6.28% of the world's population, are affected by type 2 diabetes and that it ranks as the

ninth leading cause of death, with more than 1 million deaths in 2017 alone.² According to the International Diabetes Federation (IDF) report, there are an estimated 7 million patients with diabetes between the ages of 20-79 in Turkey, and this figure corresponds to approximately 15% of the total adult population.³

The increasing prevalence and incidence of T2DM combined with its costly complications, puts a significant burden on healthcare. It is estimated that around 12% of global health expenditures are devoted to diabetes-related costs.⁴ It is important to provide effective diabetes management with active patient participation in terms of reducing the burden of individual and social diabetes.⁵ Health literacy is an important factor in diabetes self-management so that patients can understand new terminologies and self-care concepts, make therapeutic

Corresponding author:

İlknur Özkan,
Akdeniz University, Kumluca Faculty of Health Sciences,
Internal Medicine Nursing Department, Kumluca-
Antalya/Turkey
Tel: +905332275272
Email: ilknurozkan@akdeniz.edu.tr

healthcare decisions, and perform daily self-management activities for optimal diabetes control.⁶

Health literacy is defined as the level of individuals' capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.⁷⁻⁹ Many studies have shown that poor health literacy is associated with adverse health outcomes in patients with T2DM. These patients have difficulty reading instructions and understanding health advice or warnings, have less knowledge about the disease, have worse medication adherence, spend more money on healthcare, have poorer patient-doctor communication, and are less involved in joint decision-making.^{7,10} Some studies have shown that a higher level of health literacy is associated with a lower level of A1C.^{10,11} However, only one study has been found in the literature on the relationship between the health literacy of patients with T2DM and the use of complementary and alternative treatment (CAM).¹²

In the diabetes management process, patients may find it difficult to adjust to treatment due to changes in their lifestyle and habits, lack of a complete treatment of the disease, and acute-chronic complications, and they often tend to use CAM consciously or unconsciously in addition to medical treatments.¹³⁻¹⁵ Studies have reported that patients with diabetes have higher rates of using CAM than other patient groups.^{16,17} While some of these practices may be effective, most of them have not been proven effective for glucose control. It has also been reported that these practices may be incompatible with the patient's medications and may lead to additional complications.¹³⁻¹⁵ For this reason, health professionals need to evaluate patients' health literacy and their use of CAM to ensure effective diabetes self-management. The purpose of this study to examine the relationship between the health literacy of patients with type 2 diabetes and the complementary and alternative therapy they use in diabetes self-management.

Methods

Population and sample of the study

The population of the study consisted of patients with T2DM who were followed up and treated in the Endocrinology and Metabolic Diseases outpatient clinic of a training hospital in Istanbul between December 5, 2020 and May 5, 2021, and the sample consisted of individuals

who met the inclusion criteria within the specified universe. The sample size was determined as 356 subjects at a 95% confidence interval using the sampling the known universe calculation method, and 1076 patients with T2DM participated in the study eventually. At the end of the study, the error level of the study was calculated by considering the post hoc sample size and the population size. The error level was determined as 2.63% at a 95% confidence interval. According to the inclusion criteria, patients who were aged 18 or over, were conscious, were diagnosed with T2DM at least 1 year ago, and volunteered to participate in the study were included in the study. Patients who were illiterate, had a T2DM diagnosis less than 1 year ago, had T1DM, or did not want to participate in the study were not included in the study.

Data Collection

The data were collected by the researchers in a quiet polyclinic room using face-to-face interview technique. Each interview took an average of 20 minutes. The data of the study were collected using a descriptive information form and the Health Literacy Scale.

The Descriptive Information Form

This form was developed by the researchers. It consists of 23 questions about the sociodemographic characteristics of the patients, disease characteristics and treatment, and the use of complementary and alternative therapies.

The Health Literacy Scale (HLS)

This scale was developed by Sørensen et al. as a 47-item questionnaire. It was later reduced to 25 items by Toçi et al.¹⁸ The simplified 25-item form was used in this study. The Turkish validity and reliability study of the simplified version was carried out by Aras and Bayık Temel.¹⁹ The scale has a five-point Likert-type evaluation structure and consists of 25 items and four sub-dimensions, namely, access to information, comprehension of information, appraisal/evaluation, and application/use. A minimum of 25 and a maximum of 125 points can be obtained from the scale. High scores from the scale indicate increased health literacy. In the adaptation study, the overall Cronbach's alpha value of the scale was .92, and the alpha values of the sub-dimensions ranged between .62 and .79.¹⁹ In the present study, Cronbach's alpha coefficients were .88 for the overall scale, and they ranged between .87 and .89 for the sub-dimensions.

Data analysis

The data were evaluated on the SPSS 23 (Statistical Package of Social Science) software package with a confidence interval of 95% and a significance level of $p < 0.05$. Kolmogorov-Smirnov test was conducted to determine whether the data were normally distributed. Descriptive statistical methods (frequency, percentage, mean score, standard deviation) were used to evaluate the data, and the Mann-Whitney U test and the Chi-square test of independence were used to compare groups. Predictors of complementary therapy use were evaluated using logistic regression analysis. To decide which of the variables would be included in the model, the forward selection method, one of the forward stepwise selection methods, was used.

Ethical Approval

Before the study was initiated, approval of the Non-Interventional Ethics Committee of a university (Approval

number: KAEK-6/08.01.2020) and written permission of the institution where the study would be conducted were obtained. After the patients were informed about the study verbal and written consent of those who volunteered to participate in the study was obtained.

Results

Descriptive characteristics

The mean age of the patients in the study was 43.36 ± 16.18 years, 40.8% were between the ages of 36-50, 68.8% were female, 44.6% were university graduates, 71.5% were married, 64.0% were employed, and 36.4% perceived their economic level as good. Also, 90.5% of the patients did not use alcohol, 77.9% did not smoke, 30.0% used oral antidiabetics, 29.8% used insulin, 80.1% were diagnosed with diabetes 1-10 years ago, mean diabetes diagnosis time was 7.04 ± 6.20 years, 82.8% used their medications regularly, 72.0% followed their diet, 52.8% went walking regularly, 66.1% did not have any other chronic diseases, 76.4% had regular diabetes check-ups. (Table 1).

Table1: Distribution of Characteristics

		n	%
Gender	Female	740	68.8
	Male	336	31.2
Age 43.36±16.18 (18-89)	18-35 Age	312	29.0
	36-50 Age	439	40.8
	51-65 Age	238	22.1
	66-89 Age	87	8.1
Education	Uneducated	59	5.5
	Primary education	46	4.3
	Secondary	210	19.5
	High school	281	26.1
	University	480	44.6
	Married	1237	71.5
Marital status	Single	493	28.5
Working Status	Yes	689	64.0
	No	387	36.0
Economic Status	Bad	343	31.9
	Middle	118	10.9
	Good	392	36.4
	Very good	223	20.8
Using alcohol	Yes	102	9.5
	No	974	90.5
Smoking	Yes	238	22.1
	No	838	77.9
Type of diabetes treatment	Only diet	267	24.8
	Oral antidiabetic treatment	323	30.0
	Oral antidiabetic treatment + insulin	165	15.3
	Insulin	321	29.8
Duration of diabetes diagnosis 7.04±6.20 (1-30)	1-10 year	862	80.1
	11-20 year	179	16.6
	21-30 year	35	3.3
Regular use of drugs	Yes	891	82.8
	No	185	17.2
Adjustment to diet	Yes	775	72.0
	No	301	28.0
Doing regular exercise (at least 3 times a week for 20 minutes)	Yes	568	52.8
	No	508	47.2
Presence of other chronic diseases	Yes	365	33.9
	No	711	66.1
Going to regular doctor check-ups	Yes	822	76.4
	No	254	23.6

Health literacy scale (HLS) scores

Participants' mean score from the overall HLS was 48.90±19.92, and the mean scores from the access to

information, comprehension of information, appraisal/evaluation, and application/use sub-dimensions were 9.58±4.68, 13.99±5.86, 15.29±6.87, and 10.03±4.26, respectively (Table 2).

Table 2: Scale sub-dimension scores and Cronbach alpha values

Scale sub-dimensions	Cronbach's alpha	Mean \pm SD (min-max)	Scale points that can be obtained
Health Literacy Scale	Access to information	.884 9.58 \pm 4.68 (5-25)	(5-25)
	Understanding information	.879 13.99 \pm 5.86 (7-32)	(7-35)
	Appraisal / evaluation	.896 15.29 \pm 6.87 (8-39)	(8-40)
	Apply / use	.888 10.03 \pm 4.26 (10-25)	(5-25)
	Total	.889 48.90 \pm 19.92 (25-125)	(25-125)

* The items are calculated by inverting.

** The sub-dimension is calculated separately.

Characteristics related to using CAM

It was determined that 61.4% of the patient's used CAM. The most frequently used complementary therapy methods were praying and the cognitive-behavioural method (83.2%). The most frequently employed biologically based therapies included cinnamon (67.9%), black cumin (52.9%), and lemon and black cumin oil (42.9%) (Table

3). Other complementary therapy methods and their rate of use are shown in Table 3. Accordingly, 98.7% of the patients found out about the use of CAM from their neighbours/friends/relatives, 65.0% used it along with treatment in the following period, 72.1% used CAM to lower blood sugar, 65.0% obtained the products they used from a herbalist, and 62.6% did not inform health professionals about the CAM they used (Table 3).

Table3: Characteristics related to using CAM

	n	%
CAM use		
Yes	661	61.4
No	415	38.6
Methods of CAM used		
Praying	550	83.2
Cinnamon	449	67.9
Black cumin seeds	350	52.9
Lemon	280	42.4
Black cumin oil	280	42.4
Green tea	262	39.6
Almond	156	23.6
Olive oil	118	17.8
Pomegranate	117	17.7
Ginger	107	16.2
Linden	104	15.7
Sage	97	14.7
Yarrow	93	14.1
Flaxseed	78	11.8
Blackhead herb	65	9.8
Chamomile tea	48	7.3
Meditation	34	5.1
Yoga	34	5.1
Drinking healing water	19	2.9
Consulting to a spiritual guide	9	1.4
Source for obtaining information on CAM use		
Neighbor/friend/relative	1062	98.7
Internet/doctor/nurse	14	1.3
Time when CAM was first used		
Immediately after diagnosis	375	34.9
Along with treatment in the later stages of the disease	701	65.1
Reason for using CAM		
Lowering blood sugar	776	72.1
Thinking that treatment is not helpful	174	16.2
Low cost	126	11.7
Source of material and information		
Herbalists	699	65.0
Personal efforts	149	13.8
Internet/television	228	21.2
Informing the healthcare professional about the CAM used		
Yes	402	37.4
No	674	62.6

Status of health literacy and complementary therapy use according to the presence of diabetic complications

Of the patients, 32.6% reported that they developed diabetic retinopathy, 12.8% diabetic nephropathy, and 19% diabetic neuropathy. A statistically significant difference was found in the scores of patients who developed dia-

betic retinopathy from the comprehension of information and appraisal/evaluation sub-dimensions of HLS, the scores of those who developed diabetic nephropathy from the overall HLS and all its sub-dimensions, and the scores of those who developed diabetic neuropathy from the overall HLS, all its sub-dimensions, and the rate of CAM use.

Table 4: Status of health literacy and complementary therapy use according to the presence of diabetic complications.

	n	%	Access to information	Understanding information	Appraisal / evaluation	Apply / use	HLS Total	Complementary therapy use	
			X±SD	X±SD	X±SD	X±SD	X±SD	Yes n (%)	No n (%)
			MW-U	MW-U	MW-U	MW-U	MW-U	X ²	
			p	p	p	p	p	p	
Diabetic retinopathy									
Yes	351	32.6	10.23±5.45	14.84±6.77	16.40±7.47	9.90±4.46	51.37±22.74	213 (60.7)	448 (61.8)
No	725	67.4	9.27±4.23	13.59±5.32	14.76±6.50	10.10±4.16	47.71±18.29	138 (39.3)	277 (38.2)
			-1.858	-1.970	-3.091	-1.204	-1.066	.123	
			.063	.049	.002	.229	.286	.726	
Diabetic nephropathy									
Yes	138	12.8	11.70±6.38	17.47±8.12	17.64±8.98	11.59±5.34	58.40±26.70	93 (67.4)	568 (60.6)
No	938	87.2	9.58±4.68	14.00±5.86	14.95±6.44	10.03±4.26	47.51±18.32	45 (32.6)	370 (39.4)
			-4.031	-4.847	-2.302	-3.483	-3.734	2.373	
			.000	.000	.021	.000	.000	.123	
Diabetic neuropathy									
Yes	204	19.0	6.46±.45	7.70±.53	8.11±.56	4.84±.33	25.45±1.78	145 (71.1)	516 (59.2)
No	872	81.0	4.68±.14	5.86±.17	6.37±.21	4.26±.13	17.88±.60	59 (28.9)	661 (61.4)
			-3.195	-3.983	-5.489	-3.327	-4.301	9.888	
			.001	.000	.000	.001	.000	.002	

Evaluation of determinants of CAM use by logistic regression analysis

The best model was formed in step 5 (Table 5). The use of CAM increased by 1.652 times in the presence of another chronic disease and 2.201 times in the presence of

diabetic neuropathy. Participants' use of complementary therapy decreased by 0.9% as their age increased, 3.3% as their score from the appraisal/evaluation sub-dimension of the HLS increased, and 33.6% as their score from the application/use sub-dimension of the HLS increased (Nagelkerke R²: .050; Model: x²= 40.656, p=0.00).

Table 5: Evaluation of determinants of CAM use by logistic regression analysis

	β	SE	Wald	p	OR	95% CI	
Constant	1.194	.233	26.293	.000	3.301		
Age	-.009	.004	5.074	.024	.991	.983	.999
Presence of other chronic diseases (1)	.502	.145	11.921	.001	1.652	1.242	2.196
Appraisal / evaluation	-.033	.009	12.208	.000	.967	.950	.986
Apply / use	-.410	.160	6.591	.010	.664	.485	.908
Diabetic neuropathy (1)	.789	.196	16.215	.000	2.201	1.499	3.231

Discussion

In the self-management of T2DM, health literacy and the use of complementary alternative therapy are two important factors that should be evaluated in patients. However, studies examining the relationship between the two are very limited. This study was conducted to examine the relationship between the health literacy of patients with T2DM and CAM they use in diabetes self-management. In this sense, it is thought that the findings of the study will contribute to the literature.

In the study, the health literacy of patients with T2DM can be interpreted as inadequate considering the minimum and maximum scores that can be obtained from the scale. In previous studies conducted in Turkey, the health literacy of patients with T2DM was evaluated as inadequate and problematic.^{8,20} Similarly, although the health literacy rates of individuals with diabetes varied in studies conducted in other countries, they were generally reported to be low.²¹⁻²³ Health literacy is an extremely important factor in terms of individual self-management by providing the individual with diabetes with the opportunity to adjust to treatment and care programs.^{7,10} For this reason, healthcare professionals should create the treatment plan and educational content by considering the patient's health literacy level from the moment the patient is diagnosed with T2DM.

In the study, the health literacy scores of patients with T2DM with diabetic neuropathy, nephropathy, and retinopathy were surprisingly higher than those without diabetes complications. In fact, the literature draws attention to the fact that an adequate level of health literacy in patients can reduce diabetes complications by increasing diabetes self-monitoring, diet and physical care, diabetes knowledge, self-efficacy, and self-care.^{7,10} Our study find-

ing, which is not consistent with the literature, can be explained by the Health Beliefs Model²⁴ and the Protection Motivation Theory,²⁵ which assume that perceived threat and negative emotional response (such as anxiety, fear) are the main determinants of preventive behaviours. In the presence of complications, patients' perception of threat and anxiety towards diabetes may have increased, and in this case, their health literacy may have increased through the motivation of health-protective behaviours.

According to the findings, more than half of the patients in the study used CAM. The most commonly used CAM domains were mind-body intervention (praying) and biologically based therapies (cinnamon, black cumin, lemon, black seed oil). Consistent with our study findings, some other studies conducted in Turkey indicated that the prevalence of CAM use in patients with T2DM increased up to 70% and that the most commonly used CAM methods were praying and use of herbal products.^{26,27} Studies examining the use of CAM by patients with T2DM worldwide showed significant differences ranging from 17% to 72.8% in terms of the methods used and the prevalence,^{13,28-30} and the reason for this was explained as differences in the values, beliefs, and cultural features of society that one lives in regarding CAM and differences in CAM practices employed.^{31,32} Some studies indicated that the use of herbal products by patients with T2DM was more common, especially in eastern countries, as in this study.^{33,34}

As in this study, in other national and international studies, it was found that health professionals did not have an effect on the decision-making process of patients with T2DM about CAM use, they generally started using CAM under the influence of family, friends, or social media, and that they did not inform health professionals about

the CAM they used.^{27,34,35} Patients preferred not to give information to healthcare professionals for the following reasons: anxiety about a negative response from healthcare professionals; fearing that the doctor would not continue the treatment; fearing that the physician would discourage the use of CAM; perceptions that healthcare professionals do not need to know about CAM; and lack of questioning about CAM by healthcare professionals.³⁶ These findings suggest that the use of CAM in patients with T2DM is unconscious. In this respect, countries must arrange their national policies on the use of CAM appropriately and raise awareness of society about the safe and effective use of CAM therapies. In addition, it will be useful to question the patients followed due to the diagnosis of T2DM in terms of CAM use and inform them about the use of CAM to prevent possible complications.

The use of CAM in patients with T2DM increased in the presence of an additional chronic disease and diabetic neuropathy. In studies examining the determinants of CAM use in patients with T2DM, no relationship was found between the use of CAM and the presence of an additional chronic disease or a diabetes-related complication.^{8,27,34} In this study, too, the presence of an additional chronic disease and diabetic neuropathy may have increased the burden of the disease and made it difficult to comply with treatment, thereby directing patients to use CAM.

In the study, the use of CAM decreased with increasing age in patients with T2DM. In a systematic review examining the Prevalence of CAM in Diabetic Patients in 14 Eastern Mediterranean Countries, Members of the World Health Organization (WHO), a positive relationship was found between age and CAM use, unlike our study finding.³⁷ Some studies showed that there was no relationship between age and the use of CAM.^{12,34}

In the current study, the use of CAM decreased as the health literacy of patients with T2DM in the appraisal/evaluation and application/use domains increased. This is thought to have stemmed from the distrust raised in individuals with high health literacy towards CAM practices. Despite legal arrangements aiming to integrate CAM with Medicine in Turkey, health professionals still do not have enough knowledge about the use of CAM and can-

not provide adequate counselling to patients and CAM practices are performed by individuals who are not health professionals. In the literature, there are no studies examining the relationship between health literacy and CAM use in patients with T2DM in Turkey, but only one study that was conducted in another country has been found. In this study, conducted with 1012 patients with T2DM in Thailand, the use of CAM increased as health literacy increased.¹² On the other hand, a few studies have examined general health literacy as an indicator of overall CAM use. Owen-Smith, McCarty, Hankerson-Dyson, and Diclem-ente (2012) determined that participants with high health literacy were more likely to use CAM than those with low health literacy among African Americans with AIDS.^{38,39} Gardiner et al. (2013) found that although there was no relationship between health literacy and CAM use among non-Hispanic Black participants, the possibility of CAM use was significantly higher among White and Hispanic/other race participants with higher health literacy.⁴⁰ The inconsistency between these findings indicates that more studies are needed on the relationship between CAM use and health literacy.

The most important limitation of this study is that the results cannot be generalized to all patients with T2DM since it is a cross-sectional study. The collection of data based on patients' self-report is another limitation of the study. The strength of the study is that it is the first study in Turkey to examine the relationship between health literacy and CAM use in patients with T2DM.

Conclusion

In the study, it was determined that the health literacy of patients with T2DM was inadequate and that the use of CAM was high. While patients' CAM use decreased with increased health literacy. In line with these results, it is recommended that health professionals evaluate patients' health literacy and CAM use and provide appropriate counselling to ensure effective diabetes self-management. In addition, to protect the health and well-being of patients, strategies that will increase health literacy at the community level should be identified and more legal arrangements should be made to facilitate the integration of CAM treatment into Medicine. In addition, CAM should be included as course content in the medical and nursing faculty curricula so that health professionals can provide counselling on the safe and effective use of CAM treatments.

Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

Funding/Acknowledgments

The author(s) received no financial support for the research.

References

1. Lin X, Xu Y, Pan X, et al. Global, regional, and national burden and trend of diabetes in 195 countries and territories: an analysis from 1990 to 2025. *Scientific Reports*. 2020;10(1):1-11.
2. Khan MAB, Hashim MJ, King JK, Govender RD, Mustafa H, Al Kaabi J. Epidemiology of type 2 diabetes—global burden of disease and forecasted trends. *Journal of Epidemiology and Global Health*. 2020;10(1):107.
3. IDF. IDF diabetes atlas 8th edition. *International Diabetes Federation*. 2017:905-911.
4. Ogurtsova K, da Rocha Fernandes J, Huang Y, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. *Diabetes Research and Clinical Practice*. 2017; 128:40-50.
5. Fang M. Trends in diabetes management among US adults: 1999–2016. *Journal of General Internal Medicine*. 2020;35(5):1427-1434.
6. Bailey SC, Brega AG, Crutchfield TM, et al. Update on health literacy and diabetes. *The Diabetes Educator*. 2014;40(5):581-604.
7. Dahal PK, Hosseinzadeh H. Association of health literacy and diabetes self-management: a systematic review. *Australian Journal of Primary Health*. 2020;25(6):526-533.
8. İlhan N, Telli S, Temel B, Aştı T. Health literacy and diabetes self-care in individuals with type 2 diabetes in Turkey. *Primary Care Diabetes*. 2021;15(1):74-79.
9. Liu C, Wang D, Liu C, et al. What is the meaning of health literacy? A systematic review and qualitative synthesis. *Family Medicine and Community Health*. 2020;8(2)
10. Marciano L, Camerini A-L, Schulz PJ. The role of health literacy in diabetes knowledge, self-care, and glycemic control: a meta-analysis. *Journal of General Internal Medicine*. 2019;34(6):1007-1017.
11. Huang Y-M, Shiyambola OO, Smith PD. Association of health literacy and medication self-efficacy with medication adherence and diabetes control. *Patient Preference and Adherence*. 2018; 12:793.
12. Charoencheewakul C, Laohasiriwong W, Suwanaphant K, Sopon A. Health Literacy and Complementary and Alternative Medicine Use among Type 2 Diabetes Mellitus Patients in the Northeast of Thailand. *Kathmandu Univ Med J*. 2019;66(2):107-13.
13. Alzahrani AS, Price MJ, Greenfield SM, Paudyal V. Global prevalence and types of complementary and alternative medicines use amongst adults with diabetes: systematic review and meta-analysis. *European Journal of Clinical Pharmacology*. 2021:1-16.
14. Chavan P, Karale P, Thaware P, Misar P. Complementary and alternative medicine in association with type 2 diabetes mellitus. *International Journal of Current Research and Review*. 2020;12(17):156-162.
15. Owusu S, Gaye Y-E, Hall S, et al. Factors associated with the use of complementary and alternative therapies among patients with hypertension and type 2 diabetes mellitus in Western Jamaica: a cross-sectional study. *BMC Complementary Medicine and Therapies*. 2020;20(1):1-11.
16. Egede LE, Ye X, Zheng D, Silverstein MD. The prevalence and pattern of complementary and alternative medicine use in individuals with diabetes. *Diabetes Care*. 2002;25(2):324-329.
17. Vishnu N, Mini G, Thankappan K. Complementary and alternative medicine use by diabetes patients in Kerala, India. *Global Health, Epidemiology and Genomics*. 2017;2: E6
18. Toçi E, Burazeri G, Sorensen K, et al. Health literacy and socioeconomic characteristics among older people in transitional Kosovo. *Journal of Advances in Medicine and Medical Research*. 2013:1646-1658.
19. Aras Z, Temel Bayık A. Sağlık Okuryazarlığı Ölçeği'nin Türkçe Formunun Geçerlik ve Güvenirliğinin Değerlendirilmesi. *Florence Nightingale Hemşirelik Dergisi*. 2017;25(2):85-94.
20. Güner TA, Ayşe K, Bayraktaroğlu T. Diyabetli bireylerde sağlık okuryazarlığı ve akılcı ilaç kullanımını arasındaki ilişki. *Türkiye Diyabet ve Obezite Dergisi*. 2020;4(3):214-223.
21. Hussein SH, Almajran A, Albatineh AN. Prevalence of health literacy and its correlates among patients with type II diabetes in Kuwait: A population-based study. *Diabetes Research and Clinical Practice*. 2018; 141:118-125.
22. Niknami M, Mirbalouchzei A, Zareban I, Kalkalinia E, Rikhtgarha G, Hosseinzadeh H. Association of health literacy with type 2 diabetes mellitus self-management and clinical outcomes within the primary care setting of Iran. *Australian Journal of Primary Health*. 2018;24(2):162-170.
23. Singh S, Acharya SD, Kamath A, Ullal SD, Urval RP.

- Health literacy status and understanding of the prescription instructions in diabetic patients. *Journal of Diabetes Research*. 2018;2018
24. Hochbaum G, Rosenstock I, Kegels S. Health belief model. United States Public Health Service. 1952;1 URL: <https://academia.edu>.
25. Rogers RW. A protection motivation theory of fear appeals and attitude change1. *The Journal of Psychology*. 1975;91(1):93-114.
26. Çalik A. Diyabet Tedavisinde Kullanılan Tamamlayıcı Ve Alternatif Tedaviler: Literatür Derlemesi. *Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi*. 2017;1(2):79-84.
27. Kaynak İ, Polat Ü. Diabetes mellitus' lu hastaların tamamlayıcı ve alternatif tedavileri kullanma durumları ve diyabet tutumları ile ilişkisi. *Genel Tıp Dergisi*. 2017;27(2)
28. Baharom N, Azhar SS, Rotina AB. Prevalence of Complementary Alternative Medicine Use among Patients with Type II Diabetes in Negeri Sembilan, Malaysia. *Medicine and Health-Kuala Lumpur*. 2016;11(2):257-266. doi:10.17576/mh.2016.1102.14
29. El-Bayoumy I. Pattern of use of complementary and alternative medicine among type 2 diabetes mellitus patients in Kuwait. *Diabetes Technology & Therapeutics*. 2021;23: A159-A160.
30. Fan PEM, Chan MF, Chan YL, Koh SLS. Patterns of complementary and alternative medicine use among a group of patients with type 2 diabetes receiving outpatient care in Singapore. *International Journal of Nursing Practice*. Sep 2013;19:44-55 PubMed . doi:10.1111/ijn.12173
31. Villa-Caballero L, Huey RG, Diaz-Redondo A, William PH, Lawrence P, Steven EV. Ethnic differences in complementary and alternative medicine use among patients with diabetes. *Diabetes*. 2006;55: A432-A432.
32. Villa-Caballero L, Morello CM, Chynoweth ME, et al. Ethnic differences in complementary and alternative medicine use among patients with diabetes. *Complementary Therapies in Medicine*. 2010;18(6):241-248. Doi: 10.1016/j.ctim.2010.09.007
33. Naja F, Mousa D, Alameddine M, Shoaib H, Itani L, Mourad Y. Prevalence and correlates of complementary and alternative medicine use among diabetic patients in Beirut, Lebanon: a cross-sectional study. *BMC Complementary and Alternative Medicine*. 2014;14(1):1-11.
34. Radwan H, Hasan H, Hamadeh R, et al. Complementary and alternative medicine use among patients with type 2 diabetes living in the United Arab Emirates. *BMC Complementary Medicine and Therapies*. 2020;20(1)216. doi:10.1186/s12906-020-03011-5
35. Goldman AW, Cornwell B. Social network bridging potential and the use of complementary and alternative medicine in later life. *Social Science & Medicine*. 2015; 140:69-80.
36. Robinson A, McGrail MR. Disclosure of CAM use to medical practitioners: a review of qualitative and quantitative studies. *Complementary Therapies in Medicine*. 2004;12(2-3):90-98.
37. Adib-Hajbaghery M, Ardakani MF, Sotoudeh A, Asadian A. Prevalence of Complementary and Alternative Medicine (CAM) among Diabetic Patients in Eastern Mediterranean Country Members of the World Health Organization (WHO): A Review. *Journal of Herbal Medicine*. 2021:100476.
38. Bains SS, Egede LE. Association of health literacy with complementary and alternative medicine use: a cross-sectional study in adult primary care patients. *BMC Complementary and Alternative Medicine*. 2011;11(1):1-8.
39. Owen-Smith A, McCarty F, Hankerson-Dyson D, Di-Clemente R. Prevalence and predictors of complementary and alternative medicine use in African-Americans with acquired immune deficiency syndrome. *Focus on Alternative and Complementary Therapies*. 2012;17(1):33-42.
40. Gardiner P, Mitchell S, Filippelli AC, et al. Health literacy and complementary and alternative medicine use among underserved inpatients in a safety net hospital. *Journal of Health Communication*. 2013;18(sup1):290-297.