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Research Article

THE EFFECT OF HEALTH LITERACY ON ADAPTATION AND SELF-EFFICACY IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

Mehmet Hayrullah ÖZTÜRK[1] *Serap PARLAR KILIÇ*[2]
[1]*Şırnak University, Vocational School of Health Services, Şırnak*
[1]*İnönü University, Faculty of Nursing, Malatya*

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ABSTRACT

The aim of this study is to determine the effect of health literacy on disease adaptation and self-efficacy in patients with Type 2 diabetes mellitus. This cross-sectional study was conducted with 106 volunteer patients with Type 2 diabetes mellitus who were treated in the internal medicine, cardiology, endocrinology, physical medicine and rehabilitation clinics of a state hospital between January and May 2024. Data were evaluated by independent t-test, Pearson correlation, linear regression analysis using SPSS 22.0 software. Statistical significance level was taken as $p<0.05$. The mean age of patients with type 2 diabetes mellitus was 59.41±13.22 years. The participants' total scores were 80.50±22.54 in the Health Literacy Index, 83.84±8.63 in the Adaptation to Chronic Illness Scale and was 64.01±17.19 in the Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus. According to regression analysis, health literacy had a significant effect on both adaptation to chronic illness ($B=0.277$, $p<0.001$) and self-efficacy ($B=0.601$, $p<0.001$). In this study, patients with Type 2 diabetes mellitus had moderate health literacy, high level of adherence to chronic illness and moderate level of self-efficacy. Health literacy had a strong effect on adaptation to chronic illness and self-efficacy.

INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by elevated blood glucose levels, which can cause serious damage to the heart, kidneys, blood vessels, and nerves over time. More than 90–95% of patients with diabetes mellitus suffer from Type 2 diabetes mellitus (Babazadeh, Lotfi & Ranjbaran, 2023). Type 2 diabetes mellitus (T2DM) results from links between genetic, behavioral, and environmental risk factors (Göksu & Ünal, 2017). Being one of the major public health problems in the world and in Türkiye, T2DM is a significant cause of rising mortality and morbidity (Özpak & Pazarbaşı, 2021) and poses a global burden due to its costs on human health and the healthcare system (Butayeva, Ratan, Downie & Hosseinzadeh, 2023). According to data from the International Diabetes Federation (IDF), 537 million people worldwide had diabetes in 2021, and this figure is estimated to reach 783 million by 2045 (Sun

Mehmet Hayrullah ÖZTÜRK ✉, *hayrullah_047@hotmail.com*
Şırnak University, Vocational School of Health Services, Şırnak

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et al., 2022). According to 2019 UDF data, the prevalence of T2DM in Türkiye was reported as 14.5% (Saeedi et al., 2019).

Diabetes mellitus requires patients to actively self-manage the disease in their daily lives (Marciano, Camerini & Schulz, 2019). Therefore, patients should be equipped with adequate self-care skills to control their blood glucose levels, regulate their diet, exercise regularly, and take their medications correctly following medical recommendations (Wu et al., 2023). Non-modifiable risk factors for T2DM include age, genetics, and race, while modifiable risk factors include obesity, poor diet, chronic illnesses, and physical inactivity. A potentially modifiable risk factor for T2DM is also the level of health literacy (Tajdar et al., 2021). In general, health literacy refers to the individual skills that enable a person to access, understand, comprehend, and use health knowledge in their daily living behaviors to maintain good health (Ishikawa & Kiuchi, 2019). Low health literacy in individuals has been associated with negative health outcomes such as deterioration in overall health conditions, prolonged hospital stays, raised morbidity and mortality, poor ability to manage chronic illnesses, impaired quality of life, and elevated medical expenditures (Butayeva et al., 2023). Findings of the studies have indicated that individuals with diabetes mellitus have low levels of health literacy (Hussein, Almajran & Albatineh, 2018), and individuals with low levels of health literacy have HbA1c values above normal and less glycemic control (Alvarez et al., 2024).

For effective chronic disease management, it is crucial that individuals understand and accept all changes that they may go through due to the disease and adapt to them (Aslan, Çetkin & Demir, 2021). In order for individuals to be able to adapt to the disease, they must act in cooperation with healthcare professionals, comply with the recommendations made about the disease, care, and treatment, and assume an active role in the processes related to the illness (Lubi, 2019). Adaptation to the illness includes adhering to the treatment and care plan, taking medications regularly and correctly, avoiding self-checks, and adopting behaviors appropriate for life changes (Acaroğlu Değirmenci, 2019). Adaptation to the illness is a key factor in achieving optimal diabetes outcomes. Adaptation behavior has a strong positive correlation with disease outcomes, and there are many factors that have been suggested to affect adaptation (Yeh et al., 2018). Besides patient characteristics such as diagnosis duration, age, profession, gender, and educational level, a proper understanding of health knowledge by patients is one of the main factors that affect disease adaptation (Akpınar, Mandıracıoğlu, Ozvurmaz, Kurt & Koç, 2023). Poor health literacy is indisputably one of the major risk factors for non-adherence to medications and health behaviors (Yeh et al., 2018). Patients with poor health literacy have difficulty in adhering to treatment, accessing preventive health services, understanding their

conditions, understanding health knowledge, and taking care of themselves (Ekenler & Altınel, 2024). Moreover, health literacy serves as an important component in improving self-efficacy in individuals with diabetes mellitus (Öğüt Düzen & Sezer Balcı, 2023). Self-efficacy refers to an individual's confidence and belief in their personal abilities to engage in a particular behavior (Liang et al., 2021). Furthermore, self-efficacy is a mediator between knowledge and practice. Therefore, people's ability to acquire and apply health-related knowledge may have a significant effect on their well-being (Masoompour, Tirgari & Ghazanfari, 2017). The level of self-efficacy has a positive effect on an individual's self-care and management (Amer, Mohamed, Elbur, Abdelaziz & Elrayah, 2018). Therefore, patients' perception of self-efficacy is important during the process of illness adaptation (Kim, Sereika, Lingler, Albert & Bender, 2021). In Iran, self-efficacy has been associated with treatment adherence and physical activity in elderly patients with diabetes, and health literacy has been reported as a predictive factor of self-efficacy (Roshan, Hosseinkhani & Norouzadeh, 2023). Moreover, patients with greater health literacy may exhibit better self-efficacy behaviors, which may result in more adherence to diabetes medications and a lower level of HbA1c (Huang, Shiyanbola & Chan, 2018).

Numerous studies have examined health literacy, self-efficacy and adherence separately or together in patients with diabetes mellitus (Akpınar et al., 2023; Ekenler & Altınel, 2024; Butayeva et al., 2023; Tajdar et al., 2021). To the best of our knowledge, no study has yet investigated the correlation of health literacy with illness adaptation and self-efficacy levels in patients with T2DM. Therefore, this study aimed to investigate the effect of health literacy on illness adaptation and self-efficacy levels in patients with T2DM. The study sought answers to the following questions:

- What are the health literacy, illness adaptation, and diabetes self-efficacy levels in patients with T2DM?
- Does health literacy have an effect on the illness adaptation levels in patients with T2DM?
- Does health literacy have an effect on self-efficacy levels in patients with T2DM?
- Is there any correlation between health literacy, illness adaptation and the self-efficacy levels of patients with T2DM?

MATERIAL AND METHOD

Design of the Study

This cross-sectional study was conducted between January and May 2024 to examine the effect of health literacy on illness adaptation and self-efficacy level in patients with T2DM treated in a state hospital in the South-eastern Anatolia Region.

Population and Sample

All patients with T2DM who were treated in the internal medicine, cardiology, endocrinology, physical medicine and rehabilitation clinics of a state hospital in the South-eastern Anatolia Region between January and May 2024 were included in the study. Since the present study was designed as a cross-sectional study, sample selection was not used. The patients who had been diagnosed with T2DM for at least 6 months, were over 18 years of age, had no mental, hearing or visual impairments, were voluntary to participate in the study, and were able to communicate in Turkish were included in the study. The patients (26 patients) who had cognitive, mental or physical impairments that might prevent them from completing the questionnaire, had visual and hearing impairments, withdrew from the study during the data collection phase, and did not volunteer to participate in the study were excluded from the study. The study was conducted with 106 patients with T2DM who met the inclusion criteria in order to clarify the correlation between the variables. The questionnaires were completed by holding face-to-face interviews with the participants. It took approximately 25-30 minutes to complete the forms.

Data Collection Tools

In the present study, a Patient Information Form, the Health Literacy Index, the Adaptation to Chronic Illness Scale, and the Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus were used as data collection tools.

Personal Information Form

The researchers collected socio-demographic characteristics and disease data of individuals with T2DM based on the literature using a patient information form (Özonuk & Yılmaz, 2019; Bilgiç & Pehlivan, 2023). This form consisted of 17 questions about gender, age, marital status, educational level, profession, duration of the disease, family history of diabetes, history of other chronic diseases, type of treatment, duration of insulin injection, frequency of visits to health institutions, perceived overall health condition, diabetes training, status of

knowing how to measure blood glucose, status of considering treatment knowledge adequate, status of knowing the names of laboratory tests, and body mass index (BMI).

Health Literacy Index

This is a 47-item scale developed by Sorensen et al., in the European Health Literacy Project (The European Health Literacy Survey, HLS-EU) (2009-2012). Once again, Sorensen et al. (2013) tested the validity and reliability of the Health Literacy Index and simplified it to 25 items (Toçi et al., 2013). The Turkish validity and reliability study of the health literacy index was conducted by Bayık Temel and Aras (2017). The Health Literacy Index consists of 25 items and four subscales. *"Accessing to Information"* subscale consists of five items (items 1-5), *"Understanding Information"* subscale consists of seven items (items 6-12), *"Appraising/Evaluating Information"* subscale consists of eight items (items 13-20), and *"Applying/Using Information"* subscale consists of five items (items 21-25). The items of this five-point Likert scale are rated as "5: I have no difficulties at all; 4: I have little difficulty; 3: I have some difficulty; 2: I have great difficulty; 1: I am unable to do it/I have no ability to do it/it is impossible for me to do it." The index has no reverse items. The minimum and maximum scores for the index are 25 and 125 points, respectively. As the scores on the scale fall, the health literacy is poor, inadequate, and problematic; as the scores rise, the health literacy is excellent and adequate. The standard deviation of the scale is 0.95 and the internal consistency coefficients (Cronbach's alpha) determined for the subscales of the scale range between 0.90 and 0.94 (Bayık Temel & Aras, 2017). In the present study, its Cronbach's alpha value was found to be 0.96.

Adaptation to Chronic Illness Scale

Atik and Karatepe developed this scale in 2016. The scale is used to assess the illness adaptation level of patients with chronic illnesses. The scale has three subscales and 25 items: the items 1, 9, 10, 13, 14, 15, 16, 18, 22, 23, and 24 (maximum 55, minimum 11 points) assess physical adaptation; the items 2, 3, 5, 7, 17, 19, and 25 (maximum 35, minimum 7 points) assess social adaptation; and the items 4, 6, 8, 11, 12, 20, and 21 (maximum 35, minimum 7 points) assess psychological adaptation. The total score of the scale is 125. The higher the scores from the subscales and/or the overall scale, the higher the patients' level of adaptation to the illness. In their study, Atik and Karatepe reported that Cronbach's alpha value of the overall scale is 0.88 (Atik & Karatepe, 2016). In the present study, its Cronbach's alpha value was found to be 0.71.

Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus

The scale was developed by Bijl et al., (1999) to determine the self-efficacy levels of individuals diagnosed with T2DM (Van Der Bijl, Van Poelgeest-Eeltink & Shortridge-Baggett, 1999) and adapted into Turkish by Kara et al., (2006) (Kara, Van Der Bijl, Shortridge-Baggett, Astı & Erguney, 2006). This 5-point Likert-type scale consists of 3 subscales and 20 items. The responses to this scale are as follows: "yes, I am sure: 5 points, "yes": 4 points, "neither yes nor no": 3 points, "no": 2 points, "no, I am not sure": 1 point. The total score of the scale ranges between 20 and 100. The higher the score obtained from the scale, the higher the self-efficacy level of individuals. Cronbach's alpha value of the scale is 0.89. In this study, Cronbach's alpha value was found to be 0.95.

Ethical Considerations

In order to conduct the study, Ethics Committee Approval (2023/E-29977877-605.01-82885) was obtained from a state university and institutional permission (2023/E-35694300-044-232008291) was obtained from the Provincial Directorate of Health. The study adhered to principles of the Declaration of Helsinki. Written and verbal informed consent was obtained from the individuals who agreed to participate in the study.

Data Analysis

The data of the study were calculated using frequency, percentage, mean, standard deviation, kurtosis, skewness, Pearson correlation, linear regression and independent t-test analysis using SPSS 22.0 software. It was determined that the variables were normally distributed. Parametric methods were used to analyze the data and results were considered as statistically significant for $p<0.05$.

RESULTS

Findings on Socio-demographic and Health Conditions

The mean age of patients with T2DM was found to be 59.41±13.22 years. 70.8% of the patients were female, 34.0% were aged 51-60 years, 88.7% were married, 52.8% were illiterate, and 74.5% were categorized as "other". 34.9% of the patients were diagnosed with T2DM for 9 years or more, 54.7% had no family history of diabetes, 85.8% had any other chronic disease, 50.9% were treated with insulin, 40.6% injected insulin for 6 months to 2 years, and 32.1% visited the healthcare institution once a month for its follow-up. 55.7% of the patients considered their health as "poor." 52.8% of them did not receive training on diabetes, 70.8%

knew how to measure blood glucose, 52.8% found treatment knowledge partially sufficient; and 81.1% did not know the names of laboratory tests (Table 1).

Table 1. Socio-Demographic Characteristics and Health Conditions of the Patients

Characteristics	Frequency (n)	Percentage (%)
Gender		
Female	75	70.8
Male	31	29.2
Marital Status		
Single	12	11.3
Married	94	88.7
Educational Level		
Illiterate	56	52.8
Primary School	35	33.0
High School and above	15	14.2
Profession		
Civil servant	5	4.7
Worker	4	3.8
Retired	8	7.5
Self-employed	10	9.4
Other (Housewife, farmer, etc.)	79	74.5
Duration of Illness		
6 months - 2 years	28	26.4
3-5 years	16	15.1
6-8 years	25	23.6
9 years and above	37	34.9
Family History of Diabetes		
Yes	48	45.3
No	58	54.7
History of Other Chronic Diseases		
Yes	91	85.8
No	15	14.2
Type of Treatment		
Oral antidiabetic drug	7	6.6
Insulin	54	50.9
Oral antidiabetic drugs and insulin	45	42.5
Duration of Insulin Treatment		
6 Months-2 Years	43	40.6
3-5 years	25	23.6
6-8 years	17	16.0
9 years and above	21	19.8
Frequency of Visits to Health Institutions		
Once a month	34	32.1
Once every 2 months	21	19.8
Once every 3 months	16	15.1
Once every 6 months	24	22.6
Once a year	11	10.4
Perception of Health		
Good	24	22.6
Moderate	23	21.7

Poor	59	55.7
Status of receiving treatment on Diabetes		
Yes	50	47.2
No	56	52.8
Status of knowing How to Measure Blood Glucose		
Yes	75	70.8
No	31	29.2
Status of considering Treatment Knowledge sufficient		
Sufficient	35	33.0
Partially Sufficient	56	52.8
Poor	15	14.2
Status of knowing the Names of Laboratory Tests		
Yes	20	18.9
No	86	81.1
Body Mass Index (BMI) (kg/m^2)		
Normal Weight	19	17.9
Overweight	33	31.1
Obese	54	50.9
	Mean	**SD**
BMI	30.46	5.42
Age (year)	59.41	13.22

Mean Scores of Health Literacy, Adaptation to Illness and Self-Efficacy

The mean score of the patients on the Health Literacy Index was 80.50±22.54 (Min=25; Max=125), indicating that their health literacy level was moderate. When the subscale scores of patients with T2DM on the health literacy index were analyzed, it was found that their scores were 16.69±5.31 (Min=5; Max=25) for "accessing to information" subscale, 20.03±7.12 (Min=7; Max=35) for "understanding information" subscale, 25.61±8.22 (Min=8; Max=40) for "appraising/evaluating information" subscale, and 18.15±4.38 (Min=5; Max=25) for "applying/using information" subscale (Table 2).

The total mean score of the patients on the Adaptation to Chronic Illness Scale was 83.84±8.63 (Min=55; Max=104), indicating that the illness adaptation level of the patients was above average. The subscale scores on the scale were 38.50±5.68 (Min=20; Max=52) for the physical adaptation subscale, 20.30±3.03 (Min=14; Max=30) for the social adaptation subscale, and 25.03±2.98 (Min=16; Max=32) for the psychological adaptation subscale (Table 2).

On the other hand, the total mean score of the participants on the Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus was 64.01±17.19 (Min=20; Max=99). The self-efficacy levels of the patients were moderate. The mean scores for the subscales of the self-efficacy scale were 35.15±9.55 (Min=11; Max=55) for "diet and foot care control", 12.10±4.55 (Min=4; Max=20) for "medical treatment control" and 9.52±2.73 (Min=3; Max=15) for "physical exercise" (Table 2).

Table 2. Mean Scores of Health Literacy, Adaptation to Illness, and Self-Efficacy

Scales	Mean± SD.	Min-Max score	Alpha
Health Literacy Index			
Total	80.50±22.54	25.00-125.00	0.969
Accessing to information	16.69±5.31	5.00-25.00	0.945
Understanding information	20.03±7.129	7.00-35.00	0.956
Appraising/Evaluating Information	25.61±8.223	8.00-40.00	0.952
Applying/Using Information	18.15±4.386	5.00-25.00	0.922
Adaptation to Chronic Illness Scale			
Total	83.84±8.637	55.00-104.00	0.856
Physical Adaptation	38.50±5.68	20.00-52.00	0.824
Social Adaptation	20.30±3.03	14.00-30.00	0.810
Psychological Adaptation	25.03±2.98	16.00-32.00	0.836
Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus			
Total	64.01±17.19	20.00-99.00	0.954
Diet and Foot Care Control	35.15±9.552	11.00-55.000	0.906
Medical Treatment Control	12.10±4.55	4.00-20.00	0.928
Physical Exercise	9.52±2.73	3.00-15.00	0.929

The Correlation Between Health Literacy and Adaptation to Illness and Self-Efficacy

According to the correlation analysis results, a positive correlation was found between the total score for adaptation to chronic illness and health literacy (r=0.724, p<0.01). Especially, a strong correlation was observed between health literacy and physical adaptation subscale (r=0.726, p<0.01), and a weaker but still significant correlation was observed between health literacy and social adaptation subscale (r=0.222, p<0.05). A moderate positive correlation was also found between the psychological adaptation subscale and health literacy (r=0.486, p<0.01).

A high positive correlation was found between the participants' total scores on the health literacy index and Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus (r=0.788, p<0.01). A similarly strong positive correlation was found between patients' health literacy and the "diet and foot care control" subscale (r=0.793, p<0.01), a moderate positive correlation between their health literacy and the "medical treatment control" subscale (r=0.703, p<0.01), and a lower, but still significant positive correlation between their health literacy and "physical exercise" (r = 0.654, p < 0.01).

Table 3. Correlation Analysis Between the Scores on Health Literacy Index and Adaptation to Chronic Illness Scale and Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus

			Health Literacy Index				
			Total	**Accessing to information**	**Understanding information**	**Appraising/ Evaluating Information**	**Applying/ Using Information**
Adaptation to Chronic Illness Scale	**Total**	r	0.724**	0.631**	0.643**	0.670**	0.658**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
	Physical Adaptation	r	0.726**	0.609**	0.617**	0.700**	0.681**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
		r	0.222*	0.175	0.277**	0.168	0.163

	Social Adaptation	p	0.022	0.073	0.004	0.085	0.096
	Psychological Adaptation	r	0.486**	0.486**	0.404**	0.433**	0.442**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus	**Total**	r	0.788**	0.719**	0.636**	0.748**	0.744**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
	Diet and Foot Care Control	r	0.793**	0.725**	0.646**	0.752**	0.741**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
	Medical Treatment Control	r	0.703**	0.628**	0.571**	0.685**	0.640**
		p	<0.001	<0.001	<0.001	<0.001	<0.001
	Physical Exercise	r	0.654**	0.624**	0.509**	0.593**	0.667**
		p	<0.001	<0.001	<0.001	<0.001	<0.001

*<0.05; **<0.01; Pearson Correlation Analysis

The Effect of Health Literacy on Adaptation to Chronic Illness and Self-Efficacy

Table 4 analyses the effect of health literacy on the score on adaptation to chronic illness. According to the regression analysis, health literacy had a significant positive effect on adaptation to chronic illness (B = 0.277, p < 0.001). This result indicated that a one-unit increase in health literacy led to a 0.277-unit increase in the score on adaptation to chronic illness. According to the standardized coefficient (β = 0.724), health literacy had a very strong effect on adaptation to chronic illness. The explanatory level of the model was high, and the R^2 value was calculated as 0.520. This suggested that health literacy accounted for 52% of the variance in the score on adaptation to chronic illness. On the other hand, the overall significance of the model was confirmed by the F value (114.735) and p value (p < 0.001). On the other hand, the Durbin-Watson value (1.966) indicated that there was no autocorrelation in the model.

Table 4. The Effect of Health Literacy on Adaptation to Chronic Illness

Independent Variable	**Unstandardized Coefficients**		**Standardized Coefficients**			**95% Confidence Interval**	
	B	**SE**	**β**	**t**	**p**	**Lower**	**Upper**
Fixed	61.516	2.164		28.421	0.000	57.224	65.808
Total Health Literacy	0.277	0.026	0.724	10.711	**0.000**	0.226	0.329

*Dependent Variable = Total Adaptation to Chronic Illness, *R=0.724; R^2=0.520; F=114.735; p=0.000; Durbin Watson Value=1.966*

On the other hand, Table 5 shows the effect of health literacy on the scores of Type 2 diabetes self-efficacy. According to the regression analysis, health literacy significantly affected the scores of Type 2 diabetes self-efficacy (B = 0.601, p <0.001). This result indicated that a one-unit increase in the health literacy score led to a 0.601-unit increase in the score on the type 2 diabetes self-efficacy. Furthermore, according to the standardized coefficient (β = 0.788), health literacy had a strong effect on Type 2 diabetes self-efficacy. The explanatory

power of the model was high, and the R^2 value was calculated as 0.617. This indicated that health literacy accounted for 61.7% of the variance in the score of Type 2 diabetes self-efficacy. The F value (170.437) and the p value of the model ($p < 0.001$) showed that the model was generally significant. The Durbin-Watson value (1.903) indicated that there was no autocorrelation in the model.

Table 5. The Effect of Health Literacy on Type 2 Diabetes Self-Efficacy

Independent Variable	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval	
	B	SE	β	t	p	Lower	Upper
Fixed	15.655	3.846		4.071	0.000	8.029	23.282
Health Literacy	0.601	0.046	0.788	13.055	**0.000**	0.510	0.692

*Dependent Variable = Type 2 Diabetes Self-Efficacy Total, *$R=0.788; R^2=0.617; F=170.437; p=0.000;$ Durbin Watson =1.903*

DISCUSSION

Low level of health literacy has been known to negatively affect the patient's adaptation to illness and self-efficacy behaviors. Therefore, this study mainly aims to determine the effect of health literacy on adaptation to illness and self-efficacy levels in patients with T2DM. The literature review suggests that this study will contribute to the related field due to its originality, as it is the first study in Türkiye to examine these three different issues in individuals with T2DM. The findings of this study indicated that patients with T2DM having a higher level of health literacy had better adaptation to illness and self-efficacy levels. In short, it highlights the important effect of health literacy on adaptation to illness and self-efficacy in patients with T2DM.

Low level of health literacy in patients with chronic diseases, especially diabetes, is associated with higher health care costs, inadequate disease management, and adverse health outcomes(Yeh et al., 2018). This study indicated that the health literacy level of individuals with T2DM was moderate (80.50±22.54). Different studies have also reported that patients with T2DM have a moderate level of health literacy (Özonuk & Yılmaz, 2019; Parlak & Şahin, 2021). The literature findings are compatible with the results of the present study. According to this data, health literacy takes an important place in Türkiye and in the world; however, health literacy levels of patients should be considered in health care services and education programs to be provided by healthcare professionals to individuals with chronic illness, and importance should be attached to taking necessary initiatives to improve the education and health literacy levels of the society.

Diabetes is a chronic disease that takes a long time to cope with psychological and cognitive problems, as well as physiological complications that may arise (Kaymaz & Akdemir, 2016). The extent to which individuals with chronic illness are affected by the illness varies according to factors such as the duration, severity, and structure of illness, and biological functions, coping capacity and problem-solving ability of the individual (Duran & Keser, 2021). Therefore, it is of great importance for the course of the disease that patients understand, accept and adapt to all changes that may arise due to the disease in order to be effective against them (Aslan et al., 2021). In order to adapt to the illness, the patient should accept the recommendations of healthcare professionals, comply with the medical treatment plan, regularly attend health checks and implement the recommended life changes (Acaroğlu Değirmenci, 2019). The present study showed that the total mean score of the patients on the adaptation to chronic illness scale was 83.84±8.63, and this mean score indicated that the patients' level of adaptation to the illness was above the mean value. Another study conducted with individuals with diabetes reported that the level of adaptation to illness was at a moderate level (Kaymaz & Akdemir, 2016), which is compatible with the present study. Another study indicated that patients' adaptation to illness had a negative correlation with duration of the illness and age and a positive correlation with quality of life (Bilgiç & Pehlivan, 2023).

Self-efficacy represents the patient's overall self-confidence, behavior, ideation and emotional reactions when faced with different environmental challenges or new circumstances. It is known that the effect of self-efficacy on health behavior and health outcomes is significant. The high self-efficacy level of patients with T2DM is one of the main factors that facilitate the management of the disease (Canbolat, Ekenler & Polat, 2022). In addition, individuals with diabetes who have a high self-efficacy level are easier to adapt to illness and can manage complications that may develop in the future more easily (Yıldız, 2021). The present study revealed that the total mean score of the Diabetes Management Self-Efficacy Scale for Patients with Type 2 Diabetes Mellitus was moderate (64.01±17.19). The related studies indicated that high self-efficacy and adaptation levels of patients with diabetes mellitus had a positive effect on the prevention of complications (Amer et al., 2018; Roshan et al., 2023). A study examining the correlation between fear of hypoglycemia and self-efficacy levels of patients with diabetes mellitus using insulin reported that the self-efficacy levels of the patients were moderate (Bal Özkaptan & Demirci, 2023). The findings of the present study are compatible with the literature. The moderate level of diabetes self-efficacy may be associated with the fact that more than half of the participants were literate, and healthcare professionals did not receive training on T2DM (Table 2).

According to the correlation analysis results of the present study, another important finding was that there was a positive correlation between health literacy and the total score of adaptation to chronic illness. Moreover, the present study revealed stronger correlations with health literacy, especially in physical and psychological adaptation, while a weaker but significant correlation was found in social adaptation. According to the regression analysis of the present study, the level of health literacy among patients with T2DM had a strong effect on adaptation to chronic illness. No studies were found in the literature that investigated the correlation between health literacy, illness adaptation, and self-efficacy level in patients with T2DM. However, there are studies in which any two of these variables were studied together. Health literacy holds an important place in the use and implementation of acquired knowledge and disease management. The related studies have indicated that the health literacy levels of individuals with chronic diseases have a great effect on their adherence to treatment (Akpınar et al., 2023; Erdoğan Yüce & Muz, 2023). Different studies have also found that those with high health literacy have high levels of adaptation to illness and adherence to treatment (Akpınar et al., 2023; Liu, Qian, Chen & He, 2020). The findings of the present study are compatible with the literature, and other studies have also shown that health literacy level plays an important role in adaptation to illness (Erdoğan Yüce & Muz, 2023; Candemir, Yıldırım, Yaşar, Erten & Göker, 2023). These results are important in terms of showing that as the health literacy levels of patients with T2DM elevate, their level of adaptation to illness may elevate.

Another important finding of this study was a high positive correlation between the total score of health literacy and the total score of Type 2 diabetes self-efficacy (Table 3). A strong correlation was observed with the health literacy of the patients, especially in the diet and foot care control subscale, a moderate correlation in the medical treatment control subscale, and a low but significant correlation in the physical exercise subscale. According to the regression analysis of this study, health literacy had a strong effect on the self-efficacy of individuals with T2DM. Health literacy plays a fundamental role in self-management, as it includes the skills necessary to improve one's health, such as the ability to be proficient in taking medications correctly, consulting doctors about exercise methods that improve symptoms, and analyzing the accuracy of health information obtained (Zou et al., 2024). The study by Öğüt Düzen and Sezer Balcı (2023) reported that the health literacy of individuals with T2DM was significantly correlated with diabetes self-efficacy (Öğüt Düzen & Sezer Balcı, 2023). There are also different studies that found a significant positive correlation between health literacy and Type 2 diabetes self-efficacy (Masoompour et al., 2017; Liu et al., 2020). The findings of the present study are compatible with the literature. These results suggest that health literacy level is a

major determinant of both adaptation to chronic illness and Type 2 diabetes self-efficacy. Therefore, it is crucial to consider an individual's health literacy levels when working to improve their adaptation to illness and raise their level of self-efficacy.

Limitations

The study was conducted with patients with T2DM treated in a state hospital in the south-eastern Türkiye. It was conducted in a single centre and not compared with other hospitals. Therefore, the results of this study may be limited to the centre of the study and should not be generalized.

CONCLUSION

The adaptation of patients with T2DM to chronic illnesses was found to be high, and their health literacy and type 2 diabetes self-efficacy were found to be moderate. Moreover, the health literacy levels of the patients had a strong effect on their adaptation to illness and self-efficacy. When the results of the present study and the findings in the relevant literature were analyzed, it was concluded that high health literacy levels in patients had a positive effect on their adaptation to their illness and their self-efficacy skills. In order to elevate the health literacy level of patients, it is important to employ diabetes nurses and establish diabetes schools in hospitals, to prepare appropriate educational materials for patients, to provide appropriate education according to the level of understanding of individuals, and to try to find answers to patients' questions in a question-and-answer format. As a result of growing technological advances, web applications should be designed to continuously improve the knowledge and skills of patients, and patients' knowledge should be constantly updated through group- or individual-based interviews. In order to raise health literacy levels, more comprehensive research should be conducted on patients. Accordingly, necessary policies and strategies should be developed by relevant institutions or organizations.

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