ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

The Relationship Between e-Health Literacy and Health Promotion Self-Care Behaviors and Predictors of e-Health Literacy in Individuals with Type 2 Diabetes Mellitus: A Cross-Sectional Study

Tip 2 Diyabetli Bireylerde e-Sağlık Okuryazarlığı ile Sağlığı Geliştirme Öz bakım Davranışları Arasındaki İlişki ve e-Sağlık Okuryazarlığının Yordayıcıları: Kesitsel Çalışma

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ABSTRACT Objective: The aim of this study was to reveal the relationship between e-Health literacy and health promotion self-care behaviors in individuals with type 2 diabetes. **Material and Methods:** This cross-sectional study was conducted in a training and research hospital. The sample consisted of 241 individuals with Type 2 diabetes. Data was collected using the Descriptive and e-Health Use Characteristics Form, e-Health Literacy Scale and The Diabetes Health Promotion Self-Care Scale. Descriptive analyses, independent sample t-test, one-way analysis of variance, correlation analysis and Multiple linear regression analyses were used to evaluate the data. **Results:** The average age of individuals with diabetes is 60.00 and 53% are female. While 84% of individuals with Type 2 diabetes have a smartphone, 61% access health information sources from the internet or social media. The mean score on e-Health literacy was 25.00 (moderate) and the mean score on the diabetes health promotion self-care was 90.00 (moderate). There was a weak, positive correlation between the mean score on the e-Health literacy and the mean score on the diabetes health promotion self-care (r=0.159; p=0.014). The mean e-Health literacy score of diabetics who have a higher level of education, are employed, have a higher income, have a smart phone, and use the internet every day and for a long time was found to be significantly higher (p<0.05). **Conclusion:** e-Health literacy is an important predictor affecting diabetes health promotion self-care. Nurses can provide interventions to increase e-health literacy levels to health promotion self-care behaviors of individuals with Type 2 diabetes.

Keywords: Diabetes mellitus; health literacy; health promotion; self-care; nursing

ÖZET Amaç: Bu çalışmanın amacı, Tip 2 diyabetli bireylerde e-sağlık okuryazarlığı ile sağlığı geliştirme öz bakım davranışları arasındaki ilişkiyi ortaya koymaktır. **Gereç ve Yöntemler:** Bu kesitsel çalışma bir eğitim ve araştırma hastanesinde yürütülmüştür. Örneklem, Tip 2 diyabetli 241 kişiden oluşmaktadır. Veriler, Tanımlayıcı ve e-Sağlık Kullanım Özellikleri Formu, e-Sağlık Okuryazarlığı Ölçeği ve Diyabet Sağlığı Geliştirme Öz Bakım Ölçeği kullanılarak toplanmıştır. Verileri değerlendirmek için tanımlayıcı analizler, bağımsız örneklem t-testi, tek yönlü varyans analizi, korelasyon analizi ve Çoklu doğrusal regresyon analizleri kullanılmıştır. **Bulgular:** Diyabetli bireylerin yaş ortalaması 60,00 olup %53'ü kadındır. Tip 2 diyabetli bireylerin %84'ünün akıllı telefonu bulunurken, %61'i internet veya sosyal medyadan sağlık bilgi kaynaklarına ulaşmaktadır. e-Sağlık okuryazarlık puanı ortalaması 25,00 (orta) ve diyabet sağlığı geliştirme öz bakımı puanı ortalaması 90,00 (orta) olarak bulunmuştur. e-Sağlık okuryazarlık puan ortalaması ile diyabet sağlığı geliştirme öz bakım puanı ortalaması arasında zayıf ve pozitif bir korelasyon bulunmuştur (r=0,159; p=0,014). Eğitim düzeyi yüksek olan, çalışan, geliri yüksek olan, akıllı telefona sahip olan, her gün ve uzun süre internet kullanan diyabetlilerin e-sağlık okuryazarlık puan ortalamasının anlamlı düzeyde daha yüksek olduğu bulunmuştur (p<0,05). **Sonuç:** e-Sağlık okuryazarlığı, diyabet sağlığı geliştirme öz bakımını etkileyen önemli bir yordayıcıdır. Hemşireler, Tip 2 diyabetli bireylerin e-Sağlık okuryazarlık düzeylerini artırmaya yönelik müdahalelerde bulunarak sağlığı geliştirme öz bakım davranışlarını geliştirebilirler.

Anahtar Kelimeler: Diyabet; sağlık okuryazarlığı; sağlığı geliştirme; öz bakım; hemşirelik

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Diabetes is a chronic condition that arises when the pancreas fails to produce enough insulin or when the body is unable to effectively utilize the insulin it produces, resulting in high levels of glucose in the blood.[1] Globally, diabetes mellitus, a chronic, progressive disease, is a public health problem.[2] According to the International Diabetes Federation (IDF), there were 537 million adults with Type 2 diabetes throughout the world in 2021. Of all European countries, Türkiye has the highest prevalence of diabetes (14.5%).[3] According to the results of the population-based 'Turkey Diabetes, Hypertension and Obesity Prevalence Study-I (TURDEP-I)' conducted in our country in 1997-1998, the prevalence of Type 2 diabetes in our population aged 20 and over was found to be 7.2% and the frequency of impaired glucose tolerance (IGT) was found to be 6.7%.[4] Twelve years later, in the 'Turkey Diabetes, Hypertension, Obesity and Endocrine Diseases Prevalence Study-II (TURDEP-II)' conducted in the same centers and in the same age group, it was observed that the prevalence of diabetes in the country reached 13.7%. When the age-specific diabetes prevalences in TURDEP-II were standardized according to the 2021 Address Based Population Registration System data, it was estimated that the estimated diabetes prevalence in the Turkish population aged 20-84 had reached 15.9% as of 2021.[5] It is observed that diabetes has increased rapidly in Türkiye over the years.[3]

Failure to adopt diabetes self-care behaviors among individuals with Type 2 diabetes can lead to the development of diabetes complications, a decline in quality of life, and significant financial burdens.[1] Therefore, community interventions are essential to promote health and encourage the adoption of self-care behaviors among individuals with T2DM. Health promotion self-care behaviors include self-management efforts such as regular exercise, diet, adherence to recommended medication, self-monitoring of blood sugar, foot care, and interpersonal relationships.[6] A good knowledge of diabetes is necessary for individuals with T2DM to acquire health-promoting self-care behaviors.[7] Studies have shown that diabetes knowledge is affected by health literacy. In other words, studies indicate that individuals with high health literacy tend to have better knowledge about

diabetes and are more likely to engage in self-care and self-management behaviors related to the condition.[8,9] Health literacy encompasses individuals' capacity to locate, comprehend, assess, and utilize health-related information and services.[10,11] Recent advancements in information technology have elevated the internet to a vital source of health-related information, enabling individuals to access a wealth of data from various platforms.[12] Individuals often turn to the internet to gather information about their health conditions prior to consulting a doctor, and may revisit online sources after their appointment to seek expert advice or recommendations.[13]

It is important to note that the internet hosts a vast amount of information, some of which may be unverified, inaccurate, and potentially harmful. It is crucial for individuals to critically evaluate the credibility of online sources before relying on them for health-related information.[10] e-Health literacy is the ability to search for, comprehend, and apply health information from electronic sources. It involves individuals accessing health-related information through digital platforms, evaluating its credibility, and using it to make informed health decisions in the digital age. e-Health literacy helps individuals make the right health decisions by facilitating their access to health-related information. For example, for diabetic patients, being able to access accurate information from digital sources and making sense of this information helps them make informed decisions about disease management and self-care.[10,11] Research studies have shown that the level of e-Health literacy can have an impact on an individual's ability to engage in self-care, self-management of their health condition, and have an effect on metabolic control.[14-16] In the study conducted by Altaş et al. on Type 2 diabetics, a positive correlation was observed between the scores of e-Health literacy and self-care management.[14] In the study by Kim et al. e-Health literacy was found to be an important predictor that positively affects health-promoting behaviors in individuals with Type 2 diabetes.[15] In a study by Guo et al. it was determined that mobile e-Health literacy positively influenced glycemic control and self-care behavior in individuals diagnosed with Type 2 diabetes.[16]

In the literature, the study conducted by Kim et al. is the only one that has explored the association between e-Health literacy and health promotion self-care behaviors in individuals with Type 2 diabetes.[15] Increasing e-Health literacy can provide many important benefits in diabetes management, because increasing individuals' access to digital health information and supporting them to use this information effectively plays a critical role in the daily management of diabetes. In this context, high e-Health literacy provides individuals with diabetes with access to reliable information and allows them to benefit from guidance, educational materials, video tutorials and interactive applications provided in the digital environment.[8] Mobile health applications for individuals with diabetes can provide digital reminders to remember medication times, record blood sugar levels and go to regular doctor check-ups, which increases self-management and can prevent long-term complications of diabetes. In addition, e-Health literacy allows diabetic patients to connect with individuals experiencing similar problems or experts in the digital environment. Individuals can share their diabetes-related concerns and receive support in stress management through online communities, support groups and counseling services.[15,16] This research is essential for informing future electronic-based strategic interventions aimed at improving the health outcomes of individuals with Type 2 diabetes.

Research Questions

1. What are the levels of e-Health literacy and diabetes health promotion self-care behaviors in individuals with Type 2 diabetes?

2. Is there a relation between e-Health literacy and diabetes health promotion self-care behaviors in individuals with Type 2 diabetes?

3. What are the predictors of e-Health literacy in individuals with Type 2 diabetes?

MATERIAL AND METHODS

STUDY DESIGN

This study used a cross-sectional research design.

STUDY SETTING AND SAMPLE

The study was conducted in the internal medicine and diabetes outpatient clinics of a training and research hospital in Istanbul, Türkiye, between October 2023 and December 2023.

The study population comprised individuals with Type 2 diabetes presenting to the internal medicine and diabetes outpatient clinics of a training and research hospital. Inclusion criteria for sampling were age of between 18-65 years, treatment with oral antidiabetic drugs and/or insulin (diabetes management becomes more difficult in these groups), minimum one-year time from the diagnosis of Type 2 diabetes (since diabetic individuals are checked every six months if their last HbA1c% value is within the target range, every three months if your medication is changed or if their last HbA1c% value is not within the target range), ability to read and write in Turkish, being at least a primary school graduate (to fill the scales) and agreement with participation in the study.[17,18]

Convenience sampling was employed, and individuals with Type 2 diabetes who met the inclusion criteria were included in the study. The sample size was calculated using G*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, Germany).[19] Based on the 0.235 correlation coefficient between health literacy and diabetes self-care reported by Altaş et al.[14] The sample size required for correlation analysis with a 5% margin of error ($\alpha=0.05$), a value of 0 for h0 and a power of 95% was found to be at least 229 people (n=241).

INSTRUMENTS

Data were collected using a descriptive characteristics form, the e-Health Literacy Scale (e-HLS), and the Diabetes Health Promotion Self-Care Scale (DHPSCS).

DESCRIPTIVE AND E-HEALTH USE CHARACTERISTICS FORM

The descriptive characteristics form was prepared considering the literature and is composed of questions about age, gender, education, marital status, smoking, alcohol intake, time from the diagnosis of diabetes, Type of treatment, HbA1c% levels, and

using internet.[6,8,9,14] HbA1c% information of diabetic individuals was obtained from the e-nabız application in accordance with patient consent (the latest value was taken as reference).

e-HEALTH LITERACY SCALE

This scale was developed in English by Norman and Skinner and its validity and reliability in Turkish were established by Uskun et al.[20,21] The scale was designed to measure individuals' knowledge, comfort, and skills in finding, evaluating, and applying electronic health information related to their health problems. It is an 8-item, one-dimensional scale using a 5-point Likert-type format (1=strongly disagree, 5=strongly agree). The lowest possible score is 8, and the highest is 40, with higher scores indicating higher levels of e-Health literacy. The Cronbach's alpha value for the Turkish version of the scale was found to be 0.97. The goodness of fit indices for the scale are: χ^2/df=4.645, RMSEA=0.096, CFI=0.990, SRMR=0.024, GFI=0.964, AGFI=0.900, NFI=0.987. In the present study, the Cronbach's alpha for the scale was found to be 0.98.

THE DIABETES HEALTH PROMOTION SELF-CARE SCALE

The DHPSCS was developed by Wang et al. and consists of 28 items across seven behavioral subscales: diet, exercise, blood glucose self-monitoring, adherence to recommended regimes, foot care, interpersonal relationships, and personal health responsibility. It is a five-point Likert scale where five correspond to "always" and one corresponds to "never".[22] The scale is filled out based on self-reporting. All items are positive. High scores indicate an increase in health promotion self-care behaviors. The validity and reliability of the DHPSCS were established by Peker Karatoprak et al. with a reported Cronbach's alpha of 0.92.[6] In the current study, Cronbach's alpha for the scale was found to be 0.89. The goodness of fit indices for the scale are: RMSEA=0.072, AGFI=0.830, GFI=0.870. In the present study, the Cronbach's alpha for the scale was found to be 0.98.

PROCEDURE

Individuals with T2DM who met the inclusion criteria were informed about the aim and scope of the study after their examinations in the internal medicine and diabetes outpatient clinics. Data collection was conducted face-to-face in the waiting rooms of the outpatient clinics. Face-to-face data collection gives researchers the opportunity to ask questions and provides detailed explanations about the scale items to participants. Before filling out the data collection tools, informed consent was obtained from each participant. On average, data collection took 15-20 minutes per patient.

STATISTICAL ANALYSIS

The data were analyzed using the SPSS version 22.0 (IBM, USA). Descriptive statistics, including mean, standard deviation, and percentage, were used to present data on descriptive characteristics and the e-HLS and DHPSCS scores. Since the data collected with the e-HLS and DHPSCS followed a normal distribution (Skewness/Kurtosis for e-HLS: -0.414/-1.096; Skewness/Kurtosis for DHPSCS: -0.059/-0.011), parametric tests were used for data analysis.[23] An independent samples t-test was employed to determine differences in mean scores on the e-HLS and DHPSCS in terms of sociodemographic features between two groups, and a Bonferroni corrected one-way one-way analysis of variance was used to determine differences among three or more groups. The relationship between the mean e-HLS score and the mean DHPSCS score was examined using Pearson correlation analysis. Multiple linear regression analysis was conducted to identify predictors affecting the DHPSCS. Variables showing a significant difference in the mean DHPSCS score between groups based on sociodemographic characteristics were included in the regression analysis. A p-value of less than 0.05 was considered statistically significant.

ETHICAL CONSIDERATION

This study was conducted in accordance with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee (Date: August 21, 2023/Decision number: 2023-16). Informed consent was obtained from all individuals with Type 2 diabetes prior to the initiation of the study. Additionally, permission was received from the hospital where the study was conducted (Date: September 08, 2023/Decision number: 07). Permission was also ob-

tained via email from the researchers who developed the scales used for data collection.

RESULTS

PARTICIPANT CHARACTERISTICS

Individuals with Type 2 diabetes included in the study had a mean age of 59.78±7.66 years. Among all participants, 52.70% were female. Additionally, 38.30% of the participants had been diagnosed with diabetes for more than 11 years. The mean HbA1c% was 6.97 (Table 1). Moreover, 84% of individuals with Type 2 diabetes owned a smartphone, and 61.00% reported accessing health information sources from the internet or social media, with 47.70% of participants stating they used the internet every day (Table 2).

THE RELATIONSHIP BETWEEN THE e-HLS AND DHPSCS MEAN SCORES

The mean score on the e-HLS was 24.61±10.52 (moderate) and the mean score on the DHPSCS was 89.79±17.13 (moderate). The mean score on the e-HLS showed a weak, positive correlation with the mean score on the DHPSCS ($r=0.159$; $p=0.014$) (Table 3).

THE COMPARISON OF THE MEAN SCORES ON THE e-HLS AND THE DHPSCS BETWEEN DESCRIPTIVE AND e-HEALTH USE CHARACTERISTICS

Among individuals with Type 2 diabetes, the e-HLS mean score of the group with a university degree or higher was found to be significantly higher than that of individuals with other levels of education. The e-HLS mean score of employed diabetics was found to be significantly higher than that of unemployed individuals, and those with higher incomes were found to be significantly higher than those with equal or lower incomes. The e-HLS mean score of those with diabetes years of less than 5 years was found to be significantly higher (Table 4). The e-HLS mean score was found to be significantly higher among those who own a smartphone, use the internet every day, spend 91 minutes or more on the internet daily, believe that the internet has a positive effect on health, and consider access to health resources on the internet important ($p<0.05$) (Table 4).

TABLE 1: Demographic characteristics of the individual with Type 2 diabetes (n=241).		
Characteristics	n (%)	X̄±SD (Minimum-Maximum)
Age (year)		59.78±7.66 (31-65)
Gender		
Female	127 (52.70)	
Male	114 (43.30)	
Education level		
Primary school	109 (45.20)	
Middle school	68 (28.20)	
High school	45 (18.70)	
University or a higher education level	19 (7.90)	
Marital status		
Married	198 (82.20)	
Unmarried/divorced/dead	43 (18.80)	
Occupation		
Not working	95 (39.40)	
Retired	107 (44.40)	
Working	39 (16.20)	
Health insurance		
No	11 (4.60)	
Yes	230 (95.40)	
Income		
Income less than expenses	45 (18.70)	
Income equals expenses	162 (67.20)	
Income more than expenses	34 (14.10)	
Smoking		
I have never smoked	81 (33.60)	
I quit smoking	79 (32.80)	
I'm smoking	81 (33.60)	
Alcohol intake		
I have never drunk alcohol	149 (61.80)	
I quit alcohol	70 (29.00)	
I drink alcohol	22 (9.10)	
Duration of diabetes (years)		11.63±7.96 (1-50)
Less than 5 years	84 (35.70)	65 (27.00)
6-10 years	61 (26.0)	64 (26.60)
More than 11 years	90 (38.30)	112 (46.50)
HbA1c%		6.97±1.40 (4.80±12.80)
Duration of medication (years)		10.75±7.08 (1-30)
Medication types		
Oral medication	138 (57.30)	
Oral medication+insulin injection	57 (23.70)	
Insulin injection	46 (19.00)	
Frequency of going to diabetes control		
Quarterly	92 (38.20)	
Once every six months or once a year	94 (39.00)	
Once a year	35 (14.50)	
Every two to three years	20 (8.30)	
Chronic disease other than diabetes		
No	91 (37.80)	
Yes	150 (62.20)	

X̄: Mean; SD: Standard deviation.

TABLE 2: Characteristics of e-Health use of the individual with Type 2 diabetes (n=241).

Characteristics	n (%)
Do you have a smartphone?	
No	38 (15.80)
Yes	203 (84.20)
Access to health information resources*	
Internet, social media	147 (61.00)
From healthcare professionals	140 (58.10)
From newspapers, television or news	109 (45.20)
From family and friends	93 (38.60)
Frequency of internet use	
Every day	115 (47.70)
Most days of the week	64 (26.60)
A few days of the week	14 (5.80)
Never	48 (19.90)
Average daily internet usage time	
0-59	114 (47.30)
60-90	67 (27.80)
91 minute and above	60 (24.90)
Do you think the internet has a positive effect on your health?	
No	80 (33.20)
I'm undecided	95 (39.40)
Yes	66 (27.40)
How important is it that you can access health resources online?	
Not important	86 (35.70)
Undecided	83 (34.40)
Important	72 (29.90)

*Multiple options are marked; X̄: Mean; SD: Standard deviation.

THE FACTORS AFFECTING e-HEALTH LITERACY

The factors affecting e-HLS were working (β=0.177), smoking (yes) (β=0.157), smartphone (yes) (β=0.453), daily internet use (β=0.191), internet use duration (91 min and above) (β=0.184) and accessing health resources online (significant) (β=0.352) (Table 5).

DISCUSSION

As a result of this study, it was determined that individuals with Type 2 diabetes had a moderate level of e-Health literacy and diabetes health promotion self-care. Furthermore, a weak, positive relationship was observed between e-Health literacy and diabetes health promotion self-care. The weak relationship between e-Health literacy and diabetes health promotion self-care is due to the fact that a certain level of technological knowledge is required to use e-Health platforms effectively. Especially elderly individuals or those who are not accustomed to technology may have difficulty using these systems. As the e-Health literacy of individuals with Type 2 diabetes increases, so do their diabetes health promotion self-care behaviors. A study conducted in Taiwan showed that mobile e-Health literacy is directly related to diabetes self-care behaviors and computer, internet and mobile technology knowledge, and indirectly affects health outcomes.[16] This study highlights that e-Health literacy can help improve diabetes management and glycemic control. A study conducted in Korea determined that e-Health literacy is an important factor in improving diabetes health.[15] In a study conducted in Türkiye, as the e-Health literacy of individuals with diabetes increases, self-care management also increases.[14] e-Health literacy enables individuals to easily access accurate and up-to-date health information.

TABLE 3: The mean scores on the e-HLS and DHPSCS and their correlations.				
	X̄	SD	Minimum-Maximum	Correlation
e-HLS	24.61	10.52	8.00-40.00	
DHPSCS	89.79	17.13	47.00-135.00	
Interpersonal relationships	25.62	5.81	09.00-53.00	
Blood glucose self-monitoring	15.87	4.79	5.00-25.00	
Personal health responsibility	16.67	5.12	5.00-63.00	
Exercise	6.99	3.29	3.00-15.00	
Diet	10.10	2.78	3.00-15.00	
Adherence to the recommended regimens	8.27	1.66	2.00-10.00	
Foot care	6.24	2.08	2.00-10.00	
e-HLS*DHPSCS				r=0.159; p=0.014

e-HLS: e-Health Literacy Scale; DHPSCS: Diabetes Health Promotion Self-Care Scale; X̄: Mean; SD: Standard deviation; r: Pearson correlation; p<0.01.

TABLE 4: The comparison of the mean scores on the e-HLS and the DHPSCS between descriptive characteristics.

Characterisics	e-HLS	DHPSCS
Gender		
Female	24.33±10.78	88.53±17.17
Male	24.92±10.26	91.20±17.04
t-test	t=-0.435 p=0.664	-1.207 p=0.228
Education level		
(1) Primary school	21.93±10.45	92.25±17.18
(2) Middle school	24.63±10.54	87.82±18.14
(3) High school	24.61±10.52	86.82±16.50
(4) University or a higher education level	28.04±9.23	89.78±13.32
ANOVA	F=7.503 p=0.000*	1.512 p=0.212
	1vs4<0.05	
	2vs4<0.05	
Marital status		
Married	24.86±10.40	89.62±17.27
Unmarried/divorced	23.48±11.07	90.58±16.62
t-test	t=0.776 p=0.438	-0.331 p=0.741
Occupation	40.80±16.86	89.62±17.52
(1) Not working	23.69±10.76	89.74±17.54
(2) Retired	23.10±10.61	91.42±16.97
(3) Working	31.02±6.88	85.79±17.13
ANOVA	F=9.313 p=0.000*	1.761 p=0.174
	1vs3<0.05	
Health insurance		
No	24.09±7.44	94.18±15.86
Yes	24.64±10.65	89.58±17.19
t-test	t=-0.170 p=0.856	0.869 p=0.386
Income		
(1) Income less than expenses	24.17±9.80	92.37±17.41
(2) Income equals expenses	23.88±10.58	88.44±17.08
(3) Income more than expenses	28.70±10.48	92.79±16.65
ANOVA	F=3.053 p=0.049*	1.553 p=0.214
	1vs3<0.05	
	2vs3<0.05	
Smoking		
(1) I have never smoked	22.55±10.24	91.49±17.96
(2) I quit smoking	23.13±10.44	89.54±17.05
(3) I'm smoking	28.12±10.09	88.34±16.40
ANOVA	F=7.186 p=0.001*	0.695 p=0.500
	1vs3<0.05	
	2vs3<0.05	
Alcohol intake		
(1) I have never drunk alcohol	23.83±11.02	89.35±17.25
(2) I quit alcohol	24.77±9.57	89.74±16.94
(3) I drink alcohol	29.40±8.88	92.95±17.13
ANOVA	F=2.736 p=0.067	0.421 p=0.657
Duration of diabetes (years)		
(1) Less than 5 years	29.07±8.05	90.15±16.00
(2) 6-10 years	25.98±10.22	86.42±16.84
(3) More than 11 years	21.25±10.88	91.51±17.77

TABLE 4: The comparison of the mean scores on the e-HLS and the DHPSCS between descriptive characteristics *(contunied)*.

	e-HLS	DHPSCS
ANOVA	F=13.36 p=0.000*	1.834 p=0.162
	1vs3<0.05	
	1vs2<0.05	
Medication types		
(1) Oral medication	25.66±10.47	90.54±17.02
(2) Oral medication+insulin injection	24.24±10.73	87.91±18.07
(3) Insulin injection	21.93±10.08	89.89±16.41
ANOVA	F=2.240 p=0.109	0.475 p=0.623
Frequency of going to diabetes control		
(1) Quarterly	25.22±10.08	89.29±17.66
(2) Once every six months or once a year	24.45±10.79	88.58±16.49
(3) Once a year	24.25±11.45	93.02±19.35
(4) Every two to three years	23.20±10.05	92.15±13.35
ANOVA	F=0.243 p=0.866	0.722 p=0.540
Chronic disease other than diabetes		
No	26.31±10.37	88.41±16.41
Yes	23.58±10.50	90.63±17.55
t-test	t=1.966 p=0.050	-0.973 p=0.331

e-HLS: e-Health Literacy Scale; DHPSCS: Diabetes Health Promotion Self-Care Scale; F= One-way analysis of variance (ANOVA); Bonferroni; t= Independent sample t-test. *p<0.05.

The internet and digital health platforms allow individuals to learn about diabetes management, receive nutrition and exercise advice, and access medical resources. Access to this information helps individuals make informed health decisions.[14] e-Health literacy makes it easier for individuals to access information and educational materials about diabetes. Digital resources such as educational videos, online courses, and health blogs encourage individuals to learn more about their disease and take a more active role in disease management.[24,25] e-Health applications help individuals continuously monitor their health status and detect abnormalities early. This allows healthcare professionals to intervene in a timely manner and individuals to manage their health conditions more effectively. For example, regular blood sugar monitoring plays a critical role in preventing diabetes complications.[24]

Diabetics with higher levels of education have been found to have higher e-Health literacy. Higher levels of education increase individuals' capacity to access and understand information. These individuals generally understand complex health information better and can make the right decisions about health.

TABLE 5: Predictors of e-health literacy.									
Independent Variables	B	SE	Beta (β)	t value	p value	F	Model (p value)	R²	Durbin Watson
Constant	24.384	1.043	-	23.369	0.000*	7.543	0.000*	0.314	1.904
Education (university and above)	0.923	1.327	0.046	0.696	0.487				
Occupation (working)	8.491	3.129	0.177	2.713	0.007*				
Income (Income more than)	0.788	1.485	0.035	0.531	0.596				
Smoking (yes)	2.689	1.102	0.157	2.440	0.016*				
Duration of diabetes (less than 5 year)	0.752	1.167	0.042	0.644	0.520				
Smartphone (yes)	13.058	1.483	0.453	8.807	0.000*				
Frequency of internet use (every day)	3.286	1.660	0.191	1.980	0.049*				
Average daily internet usage time (91 minute and above)	3.299	1.302	0.184	2.535	0.012*				
Do you think the internet has a positive effect on your health? (yes)	2.301	1.717	0.130	1.340	0.182				
How important is it that you can access health resources online? (important)	8.067	1.181	0.352	6.833	0.000*				

B: Unstandardized coefficients; SE: Standard error of coefficient; β: Standardized regression coefficient; t value: t statistic; p: The level of statistical significance; F: Anova testi; R²: Proportion of variation in dependent variable explained by regression model; *p<0.05.

Academic studies have shown that higher levels of education have a positive relationship with health literacy, which leads individuals to be more effective in health management.[15,26-28] e-Health literacy was found to be higher among people with diabetes who were employed. They had more opportunities to share and discuss health information through colleagues and professional networks at work. Such social interactions may play an important role in increasing e-Health literacy.[28] Furthermore, employed individuals frequently have regular access to digital tools like computers and the internet at their workplaces, which often results in greater proficiency in utilizing these tools. This experience enables them to use e-Health resources more effectively.[29]

Those who have a smart phone, those who use the internet frequently every day, those whose average daily internet use time is 91 minutes or more, those who think that the internet has a positive effect on health, and those who find it important to access health resources from the internet have higher e-Health literacy levels. In Kim et al.'s study, those who use the internet as a source of health information, those who use the internet for 91 minutes or more per day, and those who think that the internet is beneficial have higher e-Health literacy scores.[15] Smartphone owners are generally more familiar with technology and more able to use the internet effectively. This enhances their capacity to search, evaluate, and utilize health information. Individuals who use the internet regularly may generally have a higher level of education. Education increases individuals' ability to understand and use complex information, increasing e-Health literacy.[30,31]

Electronic health literacy is becoming increasingly important in the context of the digital transformation of modern health services. For this reason, increasing the e-Health literacy of individuals with Type 2 diabetes will enable them to use digital health resources effectively. Nurses play a crucial role in enhancing the e-Health literacy levels of individuals with Type 2 diabetes to foster their health-promoting self-care behaviors. They can facilitate this through organizing training sessions focused on utilizing e-Health resources tailored to individuals with diabetes. These sessions may involve introducing reliable health websites, demonstrating the use of digital health applications, and educating on methods for evaluating online health information.[25] Moreover, nurses can instruct individuals with diabetes on utilizing digital health applications like glucose monitoring apps and tools for diet and exercise planning. Through such interventions, nurses empower individuals with diabetes to effectively manage their health using digital tools. Such tools can help individuals monitor and manage their own health more effectively. Directing individuals to online support groups and communities on diabetes management can be effective in providing social support and sharing information on disease management. Nurses can

introduce individuals to websites and digital platforms that provide reliable and evidence-based health information. Nurses can direct individuals to these resources to ensure they have access to accurate information.

The finding in this study that individuals with diabetes spend more time on smartphones and the internet provides an opportunity for healthcare professionals to develop digitally focused strategies in patient education. Nurses can recommend mobile health applications that will facilitate disease management to individuals with diabetes and provide guidance on how to use these applications. For example, applications that offer blood sugar measurement, medication reminders, and nutrition tracking features help individuals monitor their own health data.[25] Nurses can prepare short guides or digital educational content to show patients how they can benefit from such applications. Various content such as videos, infographics, and interactive tests can attract patients' attention and support their learning processes. This content can be shared on frequently used platforms such as social media and patient portals.

LIMITATIONS

The only limitation of this study is that data collection was conducted in a single hospital, which means that the findings can only be generalized to patients in the hospital where the study was conducted, not to all diabetics.

CONCLUSION

In this study, it was observed that individuals with Type 2 diabetes exhibited a moderate level of e-Health literacy and engaged in diabetes health promotion self-care at a similar level. Furthermore, a weak, positive correlation was identified between e-Health literacy and diabetes health promotion self-care behaviors. Among Type 2 diabetics, those who have a university degree or higher, are employed, have a high income, own a smartphone, use the internet every day, use the internet for 91 minutes or more on average per day, think that the internet has a positive effect on health, and find access to health resources on the internet important have higher e-Health literacy levels. The predictors of e-Health literacy were working, smoking, smartphone use, daily internet use, internet use time and access to health resources from the internet. In order to improve the health of individuals with Type 2 diabetes and to develop self-care behaviors, nurses can provide interventions to increase e-Health literacy levels. In future studies, nurses can recommend mobile health applications that will facilitate disease management to individuals with diabetes and provide guidance on how to use these applications. Nurses can prepare short guides or digital educational content to show patients how they can benefit from such applications. Online educational sessions, webinars, and guidance services can be organized for individuals with diabetes who spend more time on the internet and smartphones.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Eda Kılınç İşleyen;* ***Design:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***Control/Supervision:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***Data Collection and/or Processing:*** *İrem Nur Özdemir;* ***Analysis and/or Interpretation:*** *Eda Kılınç İşleyen;* ***Literature Review:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***Writing the Article:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***Critical Review:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***References and Fundings:*** *Eda Kılınç İşleyen, İrem Nur Özdemir;* ***Materials:*** *Eda Kılınç İşleyen, İrem Nur Özdemir.*

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