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The Relationship Between Health Literacy and Diabetes-Related Burnout in Individuals with Type 2 Diabetes

Tip 2 Diyabetli Bireylerde Sağlık Okuryazarlığının Diyabete Bağlı Tükenmişlik ile İlişkisi

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Abstract

Objective: Health literacy is an important factor in diabetes management and may be associated with diabetes-related burnout among individuals with type 2 diabetes. The aim of this study is to assess health literacy and burnout levels in individuals with type 2 diabetes, identify associated variables, and examine the relationship between health literacy and burnout.

Materials and Methods: This descriptive and correlational study included a sample of 162 patients with type 2 diabetes who attended the diabetes outpatient clinic of a training and research hospital between May and August 2025. Data were collected using a patient identification form, the Diabetes Burnout Scale (DBS), and the Health Literacy Scale (HLS).

Results: The participants' mean total score on the DBS was 30.12±6.06, and the mean total score on the HLS was 42.40±7.00. A strong negative correlation was observed between participants' total health literacy scores and total burnout scores ($r = -0.676$; $p < 0.001$). Moreover, regression analysis indicated that health literacy dimensions explained approximately 51.5% of the variance in burnout scores ($R^2=0.515$).

Conclusion: This study demonstrated that health literacy was significantly and negatively associated with burnout, with higher health literacy scores being associated with lower burnout scores.

Keywords: Burnout, health literacy, nursing, type 2 diabetes

Öz

Amaç: Sağlık okuryazarlığı, diyabet yönetiminde önemli bir faktördür ve tip 2 diyabetli bireylerde diyabete bağlı tükenmişlik ile ilişkili olabilir. Çalışmanın amacı, tip 2 diyabetli bireylerde sağlık okuryazarlığı ile tükenmişlik düzeyini belirlemek, ilişkili değişkenleri ortaya koymak ve sağlık okuryazarlığı ile tükenmişlik arasındaki ilişkiyi incelemektir.

Materyal ve Metot: Tanımlayıcı ve ilişki arayıcı desende gerçekleştirilen çalışmanın örneklemini Mayıs-Ağustos 2025 tarihleri arasında bir eğitim ve araştırma hastanesinin diyabet polikliniğine başvuran 162 tip 2 diyabet hastası oluşturmuştur. Araştırmada veriler hasta tanılama formu, Diyabet Tükenmişlik Ölçeği (DTÖ) ve Sağlık Okuryazarlık Ölçeği (SOÖ) ile elde edilmiştir.

Bulgular: Katılımcıların DTÖ toplam puan ortalaması 30,12±6,06 ve SOÖ toplam puan ortalaması 42,40±7,00'dir. Katılımcıların sağlık okuryazarlığı toplam puanı ile tükenmişlik toplam puanı arasında orta düzeyde negatif bir ilişki bulunmuştur ($r=-0,676$; $p<0,001$). Ayrıca, sağlık okuryazarlığı boyutlarının tükenmişlik puanındaki değişimin yaklaşık %71,7'sini açıkladığı belirlenmiştir ($R^2=0.515$).

Sonuç: Bu çalışma, sağlık okuryazarlığı ile tükenmişlik arasında anlamlı ve negatif bir ilişki olduğunu ve daha yüksek sağlık okuryazarlığı puanlarının daha düşük tükenmişlik puanlarıyla ilişkili olduğunu göstermiştir.

Anahtar Kelimeler: Hemşirelik, sağlık okuryazarlığı, tip 2 diyabet, tükenmişlik

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INTRODUCTION

Type 2 diabetes is a chronic metabolic disorder characterized by hyperglycemia caused by impaired insulin secretion and/or resistance to insulin action in peripheral tissues, and it is associated with multisystem complications.[1] Type 2 diabetes is widely regarded as a major global public health problem of the 21st century due to its rapidly increasing prevalence worldwide and in Türkiye.[2-4]

One key factor that supports effective diabetes self-management is health literacy (HL).[3,5-7] HL refers to individuals' ability to access, understand, evaluate, and use health-related information to make appropriate decisions and maintain their health.[8-10] Diabetes-related HL refers to the extent to which individuals with diabetes possess the skills and abilities required to seek, analyze, understand, organize, and communicate information related to their condition in daily life, clinical environments, and other healthcare settings.[7,11] In individuals with diabetes, HL has been shown to be positively associated with self-care management,[6,7,9,12-18] glycemic control,[5,6,14,19] quality of life,[3,7,13] treatment adherence,[20-22] and perceived disease burden,[4] both directly and indirectly. The severity of type 2 diabetes symptoms, the development of complications, and the associated psychological distress—along with concerns about the future, fears of dependency, and body image–related anxieties—may increase the overall burden of the disease for individuals with diabetes.[4,23] These circumstances may be associated with greater levels of burnout among individuals with diabetes.[24] While "diabetes-related distress" refers to the emotional burden associated with diabetes, depression is considered a broader psychological condition. Diabetes burnout is defined as a profound sense of emotional exhaustion and frustration experienced by individuals with diabetes, which may lead to the neglect of self-care behaviors.[25-28] Behaviors such as neglecting self-care activities (e.g., skipping insulin doses or failing to monitor blood glucose levels), unhealthy or uncontrolled eating patterns, engagement in risk-taking behaviors, and non-attendance at clinical appointments are commonly associated with diabetes burnout.[29] Low HL may be associated with limitations in self-management skills, self-efficacy, and decision-making, which, together with the increased burden of diabetes management, may contribute to diabetes-related burnout.[25-30]

A review of the literature indicates that although numerous studies have examined HL among individuals with type 2 diabetes,[5-7,9,12-15,17,18] studies exploring the relationship between HL and burnout levels remain limited.[16,30] Although the relationship between HL and diabetes self-management has been widely investigated, evidence regarding the association between HL and diabetes-related burnout remains limited, particularly when HL is examined across its functional, communicative, and critical dimensions.

This study aimed to determine burnout levels among individuals with diabetes and to examine the association between HL and diabetes-related burnout. Based on the study's aim, the following hypothesis was formulated: There is a significant association between HL and diabetes-related burnout among individuals with diabetes. Additionally, the study's research question was: "What is the level of HL among individuals with diabetes?" "What is the level of diabetes-related burnout among individuals with diabetes?" "Is there a significant relationship between HL and diabetes-related burnout?", and "Which factors are associated with diabetes-related burnout among individuals with diabetes?".

MATERIALS AND METHODS

***Ethics Committee Approval*:** Ethical approval was obtained from the Sakarya University of Applied Sciences Ethics Committee (Date: 07.05.2025, decision no: 2025/56-05). Prior to completing the data collection forms, participants provided written informed consent indicating that they had read the study information and voluntarily agreed to participate. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Study Design: The study was designed as a descriptive and correlational study to determine the relationship between HL and burnout levels in individuals with type 2 diabetes.

Research Population and Sample: The study population consisted of individuals diagnosed with type 2 diabetes who attended the diabetes outpatient clinic of a teaching and research hospital between May and August 2025. Participants were recruited using a consecutive sampling method, whereby all patients who met the eligibility criteria and attended the clinic during the study period were invited to participate. Based on a previous study by Jafari et al.,[16] which reported a correlation coefficient of r (0.32) between diabetes burnout and HL, a priori sample size calculation was performed. Assuming a statistical power of 90% and a two-sided significance level of α (0.05), the minimum required sample size was estimated to be 152 participants.

A total of 215 individuals with type 2 diabetes were screened for eligibility. Of these, 53 individuals were excluded: 34 declined to participate, 14 had communication problems, and 5 had a psychiatric diagnosis. A total of 162 participants were included in the study.

The inclusion criteria were a diagnosis of type 2 diabetes for at least 1 year, the ability to communicate and understand the study questions, sufficient cognitive capacity to respond to the questionnaires, and agreement to participate in the study.

The exclusion criteria were the presence of communication problems, a psychiatric diagnosis, or cognitive impairment that could interfere with questionnaire completion. Cognitive status was evaluated based on the participants' clinical history and the physician's clinical assessment.

Data Collection: Data were collected from patients diagnosed with type 2 diabetes who attended the diabetes outpatient clinic between May and August 2025. Patients were initially evaluated by a physician and subsequently referred to the researcher for eligibility assessment against the inclusion criteria. Eligible patients were informed about the study's purpose and procedures, and written informed consent was obtained from those who agreed to participate. The data were collected through face-to-face interviews conducted in the outpatient clinic. Completion of the questionnaires took approximately 15 minutes.

Socio-Demographic Questionnaire: This form, prepared by the researchers, consisted of 14 items, including participants' gender, age, marital status, type of diabetes treatment, and presence of diabetes-related complications.

Diabetes Burnout Scale: The scale was originally developed by Abdoli et al.,[31] and consists of 12 items and three subscales: exhaustion, apathy, and loss of control. Items are rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The total score obtainable from the scale ranges from 12 to 60. The scale does not include a cutoff point, and higher scores indicate higher levels of burnout.[26,31] The Cronbach's alpha coefficient of the Turkish version of the scale was reported as 0.90.[26] In the present study, the Cronbach's alpha coefficient was calculated as 0.725 for exhaustion, 0.785 for apathy, and 0.767 for loss of control.

Diabetes Health Literacy Scale: The scale was originally developed by Ishikawa et al.[32] to assess functional, interactive-communicative, and critical HL in individuals with chronic diseases. The scale consists of 14 items and includes three subscales: functional HL, communicative HL, and critical HL.[32] Items are rated on a four-point Likert-type scale ranging from 1 (never) to 4 (often). The total score obtainable from the scale ranges from 14 to 56, with higher scores indicating higher levels of HL. The Cronbach's alpha coefficient of the Turkish version of the scale was reported as 0.83.[8] In the present study, the Cronbach's alpha coefficient was calculated as 0.862 for functional HL, 0.857 for communicative HL, and 0.812 for critical HL.

Statistical Analysis: Statistical analyses were performed using IBM SPSS Statistics version 26.0. The normality of the data distribution was assessed based on skewness and kurtosis values. When the distributional characteristics of the dataset were examined, the skewness and kurtosis values were 0.373 and −0.056, respectively, for the total burnout score; −1.402 and 1.180, respectively, for the functional HL subscale of the Diabetes Health Literacy Scale; −0.273 and 0.407, respectively, for the communicative health HL; and 0.377 and 0.105, respectively, for the critical HL subscale. Based on these values, the data were considered normally distributed.[33] Descriptive statistics were calculated for continuous variables, including the mean, standard deviation, minimum, and maximum values, and for categorical variables, including frequencies and percentages. Differences in HL and burnout scores by sociodemographic and clinical characteristics were examined using the independent-samples t-test for comparisons between two groups and the one-way analysis of variance (ANOVA) for comparisons among more than two groups. Post hoc tests were conducted to identify the groups responsible for significant differences when ANOVA indicated overall differences. Pearson correlation analysis was performed to examine the relationships between continuous variables. Multiple linear regression analysis was used to examine whether HL subdimensions were statistically associated with burnout. A p-value of < 0.05 was considered statistically significant.

RESULTS

The mean age of the participants was 49.82±12.54 years (range: 28–73). Of the participants, 56.8% were female. Regarding educational level, middle school graduates constituted the largest group (39.5%). The majority of participants were married (81.5%). Smoking was reported by 32.7% of the participants. Comorbid conditions other than diabetes were present in 66.7% of the participants. Regarding the duration of diabetes diagnosis, the highest proportion of participants (39.5%) was in the 6–10 year group. Most participants were treated with oral antidiabetic drugs (OADs) (56.2%). At least one diabetes-related complication was present in 53.1% of the participants. The most common complication was neuropathy (31.5%). Regarding diabetes education, 43.2% of the participants

reported having received diabetes education within the previous year. The most frequently reported blood glucose monitoring practice was measuring blood glucose levels 1–2 times per week (43.2%) (Table 1).

Table 1. Demographic characteristics of the participants (n = 162).

Characteristics		Data
Age, Mean±SD (Min.-Max.)		49.82±12.54 (28-73)
Gender, n (%)	Male	70 (43.2)
	Female	92 (56.8)
Education level, n (%)	Elementary school	45 (27.8)
	Middle school	64 (39.5)
	High school	35 (21.6)
	University	18 (11.1)
Marital status, n (%)	Single	30 (18.5)
	Married	132 (81.5)
Smoking status, n (%)	Yes	53 (32.7)
	No	109 (67.3)
Alcohol status, n (%)	Yes	29 (17.9)
	No	133 (82.1)
Presence of comorbid conditions other than diabetes, n (%)	Yes	108 (66.7)
	No	54 (33.3)
Non-diabetic comorbid conditions, n (%)	Hypertension	48 (44.4)
	Heart failure	23 (21.3)
	Asthma	14 (13.0)
	Hyperlipidemia	12 (11.1)
	COPD	7 (6.5)
	Other	4 (3.7)
Duration of diabetes, n (%)	1–5 years	22 (13.6)
	6–10 years	64 (39.5)
	11–20 years	49 (30.2)
	≥20 years	27 (16.7)
Current diabetes treatment, n (%)	Diet only	3 (1.9)
	OAD	91 (56.2)
	Insulin	24 (14.8)
	OAD + insulin	44 (27.2)
Diabetes-related complications, n (%)	None	76 (46.9)
	Neuropathy	51 (31.5)
	Nephropathy	18 (11.1)
	Retinopathy	17 (10.5)
Diabetes education in the past year, n (%)	Yes	70 (43.2)
	No	92 (56.8)
Read diabetes-related brochures in the past year, n (%)	Yes	126 (77.8)
	No	36 (22.2)
Frequency of blood glucose monitoring, n (%)	Never	17 (10.5)
	Once a month	57 (35.2)
	Once or twice a week	70 (43.2)
	Once a day	7 (4.3)
	Twice a day	11 (6.8)

n: number; %: percentage; COPD: Chronic obstructive pulmonary disease; OAD: Oral antidiabetic drugs.

Regarding the burnout subdimensions, the mean exhaustion score was 10.41±1.93, the mean apathy score was 12.63±2.80, and the mean loss-of-control score was 7.01±1.91. The mean total burnout score of the participants was 30.12±6.06 (possible range: 12–60). Regarding the subdimensions of HL, the mean functional HL score was 17.95±2.77, the mean communicative HL score was 14.20±2.83, and the mean critical HL score was 10.21±2.43. The mean total HL score of the participants was 42.40±7.00 (possible range: 14–56) (Table 2).

Table 2. Health literacy and burnout scale scores of the participants (n = 162).

Scales	Minimum-Maximum	Mean±SD
Exhaustion	5.00-16.00	10.41±1.93
Apathy	7.00-20.00	12.63±2.80
Loss of control	4.00-12.00	7.01±1.91
Total Burnout Score	17.00-47.00	30.12±6.06
Functional Health Literacy	8.00-20.00	17.95±2.77
Communicative Health Literacy	5.00-20.00	14.20±2.83
Critical Health Literacy	4.00-16.00	10.21±2.43
Total Health Literacy Score	21.00-55.00	42.40±7.00

SD: Standard Deviation.

Significant correlations were observed between participants' age and scale scores. As age increased, HL levels decreased significantly (r=−0.811, p<0.001), while burnout levels increased (r=0.740, p<0.001). Mean HL scores differed significantly by gender, with women demonstrating higher HL levels than men (t=−4.101, p<0.001). However, no significant gender-based difference was observed in burnout scores (t=−1.236, p=0.218). Significant differences were observed between groups according to educational level. As educational level increased, HL scores increased (F=63.645, p<0.001), while burnout scores decreased (F=30.731, p<0.001). Regarding marital status, HL levels were significantly higher among single participants than among married participants (t=2.170, p=0.031). In contrast, burnout levels were significantly higher among married participants (t=−4.056, p<0.001). Smoking status did not significantly affect HL scores (t=0.199, p=0.843); however, smokers had significantly higher burnout scores (t=3.009, p=0.003). Similarly, burnout scores were significantly higher among participants who consumed alcohol (t=3.843, p<0.001). The presence of comorbid conditions other than diabetes was associated with lower HL scores (t=7.336, p<0.001) and higher burnout scores (t=−8.247, p<0.001). Similarly, as the duration of diabetes diagnosis increased, HL scores decreased (F=19.487, p<0.001), while exhaustion scores increased (F=38.967, p<0.001). Participants receiving combined therapy with oral antidiabetic drugs and insulin exhibited the lowest HL scores (F=8.362, p<0.001) and the highest burnout scores (F=11.667, p<0.001). When examined according to the presence of complications, participants without complications demonstrated significantly higher HL scores (F=31.462, p<0.001) and lower burnout scores (F=22.508, p<0.001). Participants who had received diabetes education within the past year demonstrated significantly higher HL scores (t=−4.342, p<0.001) and lower burnout scores (t=3.144, p=0.002). Similarly, participants who reported reading educational brochures had higher HL scores (t=−4.595, p<0.001) and lower burnout scores (t=2.863, p=0.005). Significant differences were also observed according to blood glucose monitoring frequency. Participants who monitored their blood glucose once or twice daily demonstrated the highest HL scores (F=35.096, p<0.001) and the lowest burnout scores (F=7.839, p<0.001) (Table 3).

Table 3. Comparison of scale scores according to participants' sociodemographic characteristics (n = 162).

Characteristics		Health Literacy		Burnout	
		Mean±SD	Test-value	Mean±SD	Test-value
Age†		r=-0.811, **<0.001**		r=0.740, p**<0.001**	
Gender**	Male	39.89±6.15	-4.101	29.44±5.25	-1.236
	Female	44.28±7.03	**<0.001**	30.64±6.59	0.218
Education level***	1. Elementary school	35.55±5.53	63.645	34.97±5.56	30.731
	2. Middle school	41.98±5.16	**<0.001**	30.51±4.97	**<0.001**
	3. High school	46.77±3.67	1,2<3,4	26.82±4.14	1,2>3,4
	4. University	51.77±2.07		23.61±3.59	
Marital status**	Single	44.93±6.23	2.170	26.26±5.64	-4.056
	Married	41.84±7.06	**0.031**	31.03±5.82	**<0.001**
Smoking status**	Yes	42.25±7.52	0.199	31.13±6.19	3.009
	No	42.25±5.84	0.843	28.13±5.33	**0.003**
Alcohol status**	Yes	42.60±4.70	-0.210	30.99±6.07	3.843
	No	42.30±7.40	0.834	26.32±4.40	**<0.001**
Presence of comorbid conditions other than diabetes**	Yes	39.91±6.72	7.336	32.52±5.62	-8.247
	No	47.39±4.41	**<0.001**	25.50±3.80	**<0.001**

†: Pearson correlation test; **: Independent samples t-test; ***: Bonferroni-corrected one-way ANOVA.

Continuation of **Table 3**

Characteristics		Health Literacy		Burnout	
		Mean±SD	Test-value	Mean±SD	Test-value
Duration of diabetes[***]	1. 1–5 years	45.81±5.02	19.487	25.00±4.99	38.967
	2. 6–10 years	44.93±5.43	<0.001	28.29±4.69	**<0.001**
	3. 11–20 years	41.54±6.86	1,2>3,4	30.38±4.03	
	4. ≥20 years	35.00±6.47		38.07±5.07	
Current diabetes treatment[***]	Diet only	44.66±5.68	.362	21.33±3.05	11.667
	OAD	42.32±6.76	**<0.001**	30.22±5.89	**<0.001**
	Insulin	47.75±5.41	1,3>4	25.66±4.25	1,3<2,4
	OAD + insulin	39.44±6.71		33.02±5.46	
Diabetes-related complications[***]	None	46.77±4.40	31.462	26.62±4.02	22.508
	Neuropathy	37.37±6.50	**<0.001**	33.06±5.64	**<0.001**
	Nephropathy	40.61±5.10	1>2,3,4	33.17±4.83	1<2,3,4
	Retinopathy	39.35±7.85		34.12±7.68	
Diabetes education in the past year[**]	Yes	44.98±5.45	-4.342	28.44±5.20	3.144
	No	40.38±7.43	**<0.001**	31.42±6.39	**0.002**
Read diabetes-related brochures in the past year[**]	Yes	43.68±6.26	-4.595	29.43±5.83	2.863
	No	37.88±7.67	**<0.001**	32.75±6.31	**0.005**
Frequency of blood glucose monitoring[***]	Never	33.13±3.77	35.096	35.00±5.26	7.839
	Once a month	38.50±6.03	**<0.001**	31.85±6.60	**<0.001**
	Once or twice a week	46.24±4.43	1,2<3,4,5	28.50±4.57	1,2>3,4,5
	Once a day	48.14±4.18		27.42±5.12	
	Twice a day	47.54±6.10		26.00±6.79	

†: Pearson correlation test; **: Independent samples t-test; ***: Bonferroni-corrected one-way ANOVA.

Strong negative correlations were observed between functional HL and exhaustion (r=−0.596), apathy (r=−0.633), loss of control (r=−0.657), and total exhaustion score (r=−0.688). Communicative HL was moderately and negatively correlated with burnout (r=−0.492), apathy (r=−0.497), and loss of control (r=−0.410), and strongly and negatively correlated with total burnout score (r=−0.522). Strong negative correlations were observed between critical HL and exhaustion (r=−0.560), apathy (r=−0.534), and total burnout score (r=−0.556), while a moderate negative correlation was found with loss of control (r=−0.411). In addition, a strong negative correlation was found between the total HL score and the total burnout score (r=−0.676, p<0.001) (Table 4).

Table 4. Correlations among participants' scale scores (n = 162).

Characteristics		Functional Health Literacy	Communicative Health Literacy	Critical Health Literacy	Health Literacy Score
Exhaustion	Correlation (r) †	-0.596	-0.492	-0.560	-0.628
	p value	**<0.001****	**<0.001****	**<0.001****	**<0.001****
Apathy	Correlation (r) †	-0.633	-0.497	-0.534	-0.637
	p value	**<0.001****	**<0.001****	**<0.001****	**<0.001****
Loss of control	Correlation (r) †	-0.657	-0.410	-0.411	-0.569
	p value	**<0.001****	**<0.001****	**<0.001****	**<0.001****
Burnout Score	Correlation (r) †	-0.688	-0.522	-0.556	-0.676
	p value	**<0.001****	**<0.001****	**<0.001****	**<0.001****

†: Pearson correlation test; *: p<0.05; **: p<0.01. Correlation coefficients were interpreted according to Cohen's (1988) classification: 0.10–0.29 as weak, 0.30–0.49 as moderate, and ≥0.50 as strong correlations.

According to the multiple linear regression analysis, functional HL was significantly associated with burnout (B=−1.167, β=−0.539, t=−7.542, p<0.001), while critical HL was also significantly associated with burnout (B=−0.653, β=−0.266, t=−2.969, p=0.003). Communicative HL was not significantly associated with burnout (B=0.004, β=0.002, t=0.022, p=0.982). Multicollinearity was assessed using tolerance and variance inflation factor (VIF) values. Tolerance values ranged from 0.367 to 0.629, while VIF values ranged from 1.590 to 2.726, indicating no problematic multicollinearity among the independent variables. The overall explanatory power of the model was high (R^2=0.515), indicating that the HL dimensions explained approximately 51.5% of the variance in burnout scores (Table 5).

Table 5. Multiple linear regression analysis predicting burnout levels.

	Non-Standardized Coefficients		Standardized Coefficients	t	Tolerance	VIF	p	R^2
	Beta	SE	β					
Functional Health Literacy	-1.167	0.155	-0.539	-7.542	0.629	1.590	**0.001****	0.515
Communicative Health Literacy	0.004	0.200	0.002	0.022	0.367	2.726	0.982	
Critical Health Literacy	-0.653	0.220	-0.266	-2.969	0.400	2.498	**0.003***	

*: p<0.05; **: p<0.01 B: Unstandardized beta coefficients; SE: Standard Error of the Coefficient; β: Standardized beta coefficients; R^2: Coefficient of Determination.

DISCUSSION AND CONCLUSION

Health literacy is influenced by sociodemographic, cultural, economic, and psychosocial factors.[22] In the present study, HL levels decreased with increasing age and increased with higher educational attainment. Higher HL levels were also observed among women, single individuals, and those without chronic diseases other than diabetes. Previous studies have reported varying results regarding the sociodemographic determinants of HL among individuals with type 2 diabetes. Altunsoy and İnkaya[34] found no significant association between HL and age, gender, marital status, education, or income, although HL was lower among individuals with a family history of diabetes. Similarly, Parlak and Şahin[35] reported no relationship between HL and gender, marital status, income, employment, residence, smoking, or alcohol use, but found higher HL among individuals with at least a high school education and those who perceived their health as good. Özonuk and Yılmaz[22] reported lower HL among women, older adults, and those with lower education levels. Other studies indicated that HL increased with education, employment, good perceived health, and regular physical activity.[4,12] Abate et al.[11] reported higher HL among younger, male, and literate individuals. Overall, these findings suggest that HL among individuals with type 2 diabetes varies according to sociodemographic characteristics, likely due to differences in measurement tools and population characteristics across studies.

The findings of the present study indicate that HL levels decreased with increasing diabetes duration. Higher HL levels were observed among individuals who used insulin only, had no diabetes-related complications, had received diabetes education within the past year, and monitored their blood glucose once or twice daily. Previous studies have reported mixed results regarding the relationship between disease-related characteristics and HL among individuals with type 2 diabetes. For instance, Altunsoy and İnkaya[34] found no significant association between HL and disease duration or knowledge of complications, although HL levels were unexpectedly lower among individuals who had received diabetes education. Shin and Lee[36] reported that individuals with higher HL were more likely to engage in healthy eating and regular physical activity. Similarly, Parlak and Şahin[35] found lower HL levels among individuals diagnosed with diabetes for 6–10 years. Özonuk and Yılmaz[22] found lower HL among individuals who had not received diabetes education. In contrast, Gündoğdu and Kılavuz[12] reported higher HL levels among individuals without chronic complications. These findings suggest that disease-related factors may influence HL levels among individuals with type 2 diabetes.

The findings of the present study indicated that burnout levels increased with age and decreased with higher educational attainment. Higher burnout levels were observed among married individuals, smokers, alcohol users, and those with chronic conditions other than diabetes, whereas no significant association was found between gender and burnout. Previous studies have reported varying results. Jafari et al.[30] found that diabetes burnout was more common among men, divorced individuals, those with higher education, the unemployed, and individuals who did not seek help from healthcare professionals. Similarly, Nuari[37] reported higher rates of severe burnout among individuals aged 56–60 years, women, and those with lower education and income levels. Another study found no association between burnout and gender, age, or occupation but reported higher burnout among divorced individuals and those with poor economic conditions.[16] These findings suggest that the sociodemographic factors associated with burnout may vary among individuals with type 2 diabetes.

In addition, the present study found that burnout levels increased with longer duration of diabetes. Higher burnout was observed among individuals receiving combined therapy with oral antidiabetic drugs and insulin, those with diabetes-related complications, those who had not received diabetes education within the past year, and those who never monitored their blood glucose levels. Similar findings were reported by Nuari[37] and Kanca and Erdoğan[26], who found that longer disease duration and more complex treatment regimens were associated with higher levels of burnout. Diabetes burnout may therefore be related to the long-term burden of disease management and the fatigue associated with maintaining continuous self-care behaviors.

The findings of the present study indicated that as HL levels increased, burnout levels decreased. HL was also identified as a significant predictor of burnout, explaining approximately 51.5% of the variance in burnout levels. Similarly, Jafari et al.[16] reported that diabetes HL, social support, diabetes distress, and diabetes-related complications explained 38% of the variance in diabetes burnout among individuals with type 2 diabetes. Although mental HL and diabetes-specific HL are conceptually distinct constructs, another study reported a parallel finding: mental HL and diabetes distress explained 25% of the variance in diabetes burnout,[30] indicating a potentially similar protective mechanism across different literacy domains. In a study conducted by Shin and Lee[36] among individuals aged 60 years and older with diabetes in South Korea, those with higher HL levels were found to have better health-related outcomes. The findings of the present study also indicated that HL was most strongly associated with the exhaustion dimension of burnout. The observed association between HL and exhaustion levels may be related to the role of HL in diabetes self-management, informed decision-making, and engagement in self-care behaviors. Managing diabetes is a process that requires behavioral regulation and adherence to treatment. Inadequacies in the skills needed to access, understand, evaluate, and apply health-related information may negatively affect individuals' perceived disease burden and contribute to emotional exhaustion. Conversely, adequate HL may support the continuity of self-management skills, promote the development of appropriate healthcare behaviors, improve treatment adherence, and facilitate the management of diabetes-related complications.[16]

Several limitations should be acknowledged. Firstly, the relatively small sample size limits the generalizability of the findings to all individuals with diabetes. Second, patients were assessed only once in a hospital setting, and no long-term follow-up was conducted. Third, potentially relevant clinical and psychosocial variables, including glycemic control (e.g., HbA1c), socioeconomic status, and depressive symptoms, were not included in the analysis and may have influenced the observed association between HL and diabetes-related burnout. Finally, the findings were based on patients' self-reported data.

In conclusion, participants' HL and burnout levels were described based on their mean scores, with a significant association observed between HL and burnout. HL and burnout were also associated with several sociodemographic and disease-related characteristics. These findings highlight the important role of education in individuals with diabetes. From this perspective, nurses—who play a key role in the education, care, and treatment of individuals with diabetes—should support interventions to improve HL from the time of diagnosis. In addition, nurses should monitor the effectiveness of educational programs and guide patients in accessing reliable health information sources.

Ethical Approval: This study was approved by the Sakarya University of Applied Sciences Ethics Committee (Date: 07.05.2025, decision no: 2025/56-05). The study was subsequently conducted with patients who met the eligibility criteria. Prior to completing the data collection forms, participants provided written informed consent indicating that they had read the study information and voluntarily agreed to participate. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Conflict of Interest: No conflict of interest was declared by the authors.

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