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The Relationship Between Health Literacy and Treatment Adherence in Individuals with Type 2 Diabetes

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ABSTRACT:
Purpose: The aim of this study was to examine the relationship between health literacy levels and treatment adherence in individuals with Type 2 diabetes.
Material and Methods: This descriptive and correlational study was conducted with 220 individuals in the endocrinology outpatient clinic of a university hospital. Data were collected using the Diabetes Health Literacy Scale and the Treatment Adherence Scale. In the study, frequency, independent sample t test, F test and Pearson correlation test were used in data analysis.
Results: Participants' health literacy (34.82 ± 9.69) and treatment adherence (88.52 ± 8.22) were at a moderate level. A positive and significant correlation was found between these two factors ($r = 0.36$, $p < 0.04$). Health literacy was found to differ significantly across gender and education level, while treatment adherence differed significantly across variables of education level and diabetes education ($p < 0.05$).
Conclusion: Health literacy is important in ensuring treatment adherence in individuals with Type 2 diabetes. When providing care to individuals diagnosed with type 2 diabetes, it is recommended that each individual's health literacy and treatment adherence be assessed, and healthcare personnel use educational practices to increase health literacy to increase treatment adherence. It is also recommended to take into account gender, education level, and diabetes education when evaluating health literacy, and education level and diabetes education when evaluating compliance with treatment.
Keywords: *Type 2 diabetes; health literacy; treatment adherence; nursing*

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INTRODUCTION

Diabetes, a complex multisystem metabolic disorder characterized by hyperglycemia and rapidly spreading worldwide and in our country, leading to serious complications, is a chronic disease that reduces quality of life and increases mortality (Abel et al., 2024). According to the 2024 report of the International Diabetes Federation, approximately 540 million adults worldwide live with diabetes, and this number is expected to reach 780 million by 2045 (International Diabetes Federation [IDF], 2024). The increasing prevalence of diabetes leads to the emergence of many diseases such as cardiovascular and kidney diseases, increased disability such as blindness and limb loss, and increased use of healthcare services (Öcal & Önsüz, 2018; Abel et al., 2024). To prevent all these conditions, diabetes must be controlled, self-management must be supported, and the individual must take responsibility for the treatment process (Özonuk & Yılmaz, 2019; Dilekçi & Duru Aşiret, 2025). Health literacy (HL) has been reported to be one of the key factors in helping individuals with diabetes take this responsibility (Dilekçi & Duru Aşiret, 2025). Health literacy is defined as the cognitive and social skills necessary for an individual to access, understand, and use health-related information to maintain and improve their well-being (Güner, Kuzu & Bayraktaroğlu, 2020; Roshan et al., 2023; Pourhabibi et al., 2022). It has been reported that high health literacy can enable

individuals to take an active role in the treatment process, better understand physician recommendations, and reduce the risk of complications (Parlak & Şahin, 2021; Dilekçi & Duru Aşiret, 2025). On the other hand, low health literacy can lead to negative consequences such as incorrect medication use, resistance to treatment and deterioration of glycemic control (Pourhabibi et al. 2022; Roshan et al., 2023; Nair et al., 2023). Health literacy levels among individuals with diabetes worldwide are low (Akyol Güner, Kuzu & Bayraktaroğlu, 2020, Singh et al., 2018, Hussein, Almajran & Albatineh, 2018; Tajdar et al., 2021; İlhan et al., 2021; Nair et al., 2023). Despite this low level, health literacy has been reported to be associated with self-management and glycemic control in diabetes (Marciano et al. 2019). In addition, low health literacy has been associated with medication dosing errors, incorrect dietary practices, irregular check-ups, increased complication rates, decreased self-care, and poor treatment adherence (Bruce, Acheampong & Kretchy, 2015; Ağralı & Akyar, 2018). A high level of health literacy is emphasized as an important factor that increases self-efficacy, glycemic control, quality of life, and treatment adherence in diabetes management (Li et al., 2025; Nair et al., 2023; Pourhabibi et al., 2022). Treatment adherence is one of the key determinants of disease control and prognosis in chronic diseases. It is defined as the extent to which a patient accepts and implements medical recommendations, including both medication use and necessary lifestyle changes (Nascimento et al., 2025; Pourhabibi et al., 2022). Individuals with diabetes must adhere to medical practices and treatment programs that include diet and exercise programs to achieve glycemic control (Baykal & Kapucu, 2015; Pourhabibi et al., 2022). Non-adherence to treatment can lead to poor health, hospitalizations, severe complications, absenteeism, increased treatment costs, and death (Świątoniowska-Lonc et al., 2021; Nascimento et al., 2025). Adherence rates in individuals with diabetes are reported to range between 15% and 93% (Nascimento et al., 2025). Recent studies have revealed significant differences in treatment adherence levels among individuals with type 2 diabetes across countries (Pourhabibi et al. 2022). A meta-analysis has also shown significant differences across regions (urban/rural) (Nascimento et al., 2025). Considering that adherence to treatment in diabetes is a critical determinant of disease control and plays a significant role in preventing serious complications, and that non-adherence to treatment is a socioeconomic, medical, and psychological problem affecting not only the patient but also their family and society, it is important to identify this issue across cultures and geographies (Nascimento et al., 2025; Pourhabibi et al. 2022). Studies on health literacy and treatment adherence in patients with diabetes are limited. In recent years, the relationship between health literacy and treatment adherence in individuals with diabetes has been examined in national (Özonuk & Yılmaz, 2019; Özkan & Kara, 2022) and international (Pourhabibi, et al., 2022) studies, but inconsistencies in the literature regarding the relationship between these two factors have been emphasized (Rodrigues et al., 2024). Furthermore, considering that health literacy and treatment adherence are influenced by individual and cultural factors, show regional differences (Pourhabibi, et al., 2022; Nelson, et al., 2018), and that the results in our country differ from each other (Çorak & Uysal, 2022; Bila &Yılmaz, 2024; Ülker & Olgun, 2023), it is believed that conducting this study in our community will contribute to understanding the issue and planning necessary care. Therefore, this study was conducted to examine the relationship between health literacy and treatment adherence in individuals with type 2 diabetes.

MATERIAL and METHODS

Purpose and Type of the Study

The purpose of this descriptive, cross-sectional study is to examine the relationship between health literacy and treatment adherence in individuals with Type 2 diabetes (Nascimento et al., 2025; Pourhabibi et al. 2022; Özonuk & Yılmaz, 2019; Dilekçi & Duru Aşiret, 2025; Çorak & Uysal, 2022).

Sampling and participant

This study was conducted between December 2022 and June 2023 in the internal medicine and endocrinology clinics of a university hospital in the

central Anatolian region of Turkey. The sample size for the study was calculated using G Power V3.1.9.7, using a correlation approach. Accordingly, for a Cohen's medium-effect correlation between the two scales (ρ=0.30), a power of 0.95 (1-β error probability) and a Type 1 error of 0.05 (α error probability), the minimum sample size required was 205 individuals. Considering potential data losses, a total of 220 individuals were selected through convenience sampling to reach the targeted sample size. Individuals diagnosed with Type 2 DM according to the International Classification of Diseases (ICD-10) and meeting the inclusion criteria were included in the study. Inclusion criteria were: age 18 or older, diagnosed with Type 2 diabetes for at least one year, free of psychological distress, communicative ability, and voluntary participation in the study. Exclusion criteria included being younger than 18, having a diagnosis of Type 1 DM, having a physician-diagnosed cognitive or behavioral problem, and refusing to participate in the study.

Data Collection Tools

Descriptive Information Form: This form consists of 13 questions regarding the sociodemographic characteristics (age, gender, educational status, etc.) of individuals with Type 2 diabetes and diabetes.

Health Literacy Scale for Diabetes (HLSD): This scale was developed by Ishikawa, Takeuchi, and Yano (2008) to measure the functional, interactive, and critical health literacy of individuals with chronic diseases. The Cronbach's alpha reliability coefficient was found to be 0.78. A validity and reliability study was conducted in our country, and the Cronbach's alpha reliability coefficient was found to be 0.96 (Ağralı and Akyar, 2018). The scale consists of fourteen questions and is a 4-point Likert-type scale. It consists of three subscales: functional (items 1-5), interactive (items 6-10), and critical health literacy (items 11-14). Each item is scored as never (1 point), rarely (2 points), sometimes (3 points), and often (4 points). The scale score ranges from 14 to 56. An increase in the scores on the interactive and critical health literacy subscales indicates an increase in health literacy levels; a lower score on the functional health literacy subscale indicates a higher level of health literacy (Ağralı & Akyar, 2018). The Cronbach's alpha coefficient for this study was 0.83.

Type 2 DM Treatment Adherence Scale(T2DMTAS): The treatment adherence scale was developed by Demirtaş and Akbayrak in 2017 to assess treatment adherence in type 2 diabetes patients. This 30-item scale, which can be used to determine patient adherence to treatment, is a 5-point Likert-type scale. Cronbach's alpha was determined to be 0.77. Each item has options such as "strongly agree" (1), "agree" (2), "somewhat agree" (3), "disagree" (4), and "strongly disagree" (5). The scale is scored between 30 and 150 points. Scores between 30 and 54 on the scale indicate good treatment adherence, 55 to 125 indicate moderate treatment adherence, and 126 to 150 indicate poor treatment adherence. Higher scores indicate worse treatment adherence (Demirtaş & Akbayrak, 2017). In this study, the Cronbach's alpha coefficient for the total scale was 0.81.

Application of Data Collection Tools

After explaining the purpose of the study in accordance with the principle of informed consent, individuals who agreed to participate were administered a personal identification form, a diabetes health literacy scale, and a treatment adherence scale in a face-to-face interview by the researcher. The interviews were conducted in the hospital at a time convenient for the individuals. Completing the Personal Identification Form and scales took an average of 20-25 minutes.

Statistical Analysis

The study data were analyzed using SPSS 22.0 (SPSS, Inc., Chicago, IL, USA). Data found to be normally distributed were analyzed using the independent t-test, a parametric test, for binary variables, and the ANOVA test for groups of three or more. The relationship between health literacy and treatment adherence was determined using the Pearson correlation test. A p value of <0.05 was considered statistically significant.

Ethical Approval

To conduct the research, approval was obtained

from the university's Ethics Committee (Ethical approval number: 2022-04/17) and permission was obtained from the institution where the study was conducted. In accordance with the principles of the Declaration of Helsinki, participants were informed about the research, and their written and verbal consent was obtained.

RESULTS

The mean age of the participants was 61.81 ± 9.9 years. 58.6% were female, 49.10% were between 55 and 66 years old; 72.3% were married, 37.7% were secondary school graduates; 49.1% were housewives, 55.9% had a monthly income equal to their expenses, 38.6% had DM for 11-20 years.

Table 1. Descriptive Characteristics of the Participants (n = 220)

Characteristics	n	%
Mean of age (x̄±sd)	61.81 ± 9.9	
Gender		
Women	129	58.6
Men	91	41.4
Age		
45-55 age	52	23.63
56- 66 age	108	49.10
67≤	60	27.27
Marital status		
Married	159	72.3
Single	61	27.7
Education level		
Literate	66	30.0
Primary education	58	26.4
Secondary school	83	37.7
High school- university	13	5.9
Job		
Retired	64	29.1
Housewife	108	49.1
Employee	11	5.0
Civil servant	15	6.8
Worker	22	10
Income level		
Income less than expenses	80	36.4
Revenue equal to expenditure	123	55.9
Income exceeds expenses	17	7.7
Duration of Diabetes Mellitus		
≤10 years	56	25.5
11-20 years	85	38.6
20 years <	79	35.9
Having another chronic disease		
No	73	33.2
Yes	147	66.8
Complication status		
Yes	98	44.5
No	122	55.5
Received diabetes training		
Received	106	48.2
None	114	51.8
Professional group trained		
Nurse	183	83.18
Doctor	37	16.82
Treatment Adherence Level		
Good (30-54 points)	-	
Average (55-125 points)	212	96.4
Poor (126-150 points)	8	3.6

66.8% had a history of additional chronic diseases, 44.5% had complications, 48.2% had diabetes training, 83.18% received training from nurses, and 96.4% had moderate treatment compliance (Table 1).

Table 2 shows that the participants' total mean score on the HLSD was 34.82±9.69, the functional subscale mean score was 14.14±5.44, the interactive subscale mean score was 12.01±6.01, and the critical subscale mean score was 8.66±6.01.4.10. The total mean score on the T2DMTAS was 88.52±8.82.

Table 3 shows the results of the correlation analysis. A low-level, positive, and significant correlation (r: 0.364; p: 0.04) was found between the participants' total HLSD and T2DMTAS scores.

Table 2. Mean scores the participants obtained from the HLSD and T2DMTAS

Scales	Mean	SD
Health Literacy Scale for Diabetes	34.82	9.69
Functional health literacy	14.14	5.44
Interactive health literacy	12.01	6.01
Critical health literacy	8.66	4.10
Type 2 DM Treatment Adherence Scale	88.52	8.22

Abbreviations: Health Literacy Scale for Diabetes, HLSD; T2DMTAS, Type 2 DM Treatment Adherence Scale; SD, Standard Deviation.

Table 3. The relationship between DITUÖ and T2DMTAS

Scales	Type 2 DM Treatment Adherence Scale
Health Literacy Scale for Diabetes	-
r	0.364*
p	0.04*

*Abbreviations: Health Literacy Scale for Diabetes, HLSD; T2DMTAS, Type 2 DM Treatment Adherence Scale; *p<0.05*

Table 4. Comparison of the participants' HLSD and T2DMTAS scores in terms of some of their characteristics

Descriptive Characteristics		Health Literacy Scale for Diabetes	Type 2 DM Treatment Adherence Scale
		Mean±SD	Mean±SD
Gender[a]	Female	36.09±7.07	86.79±12.21
	Male	30.04±9.86	83.15±8.01
	p	0.005**	0.06
Education[b]	Literate	36,48±9.62	90.93±7.24
	Primary education	31.74±9.41	88.69±10.17
	Secondary school	34.77±9.41	85.79±8.46
	High school- university	40.15±5.81	84.46±8.21
	p	0.004**	0.002**
Complication status[a]	Yes	34.67±8.08	88.21±8.71
	No	34.95 ±10.84	87.82±8.94
	p	0.83	0.63
Having another chronic disease [a]	Yes	34.88±8.34	86.07±7.82
	No	34.71±12.02	85.41±9.91
	p	0.90	0.08
Receiving Diabetes education[a]	Receiving Education	35.71±8.60	86.73±9.44
	No Education	30.00±10.57	90.19±7.89
	p	0.002**	0.003**

Note. SD, Standard Deviation. *p<0.05, **p<0.01, [a] independent t Test, [b] ANOVA

A comparison of the participants' means scores on the HLSD and T2DMTAS based on their descriptive characteristics is presented in Table 3. According to the table, there were differences between the HLSD and gender, education level, and diabetes education status. However, statistically significant differences were found between the T2DMTAS total scores and education level and diabetes education status

(p<0.05). It was determined that those who were female (p: 0.005) and had a high school or university degree (p: 0.004) had higher HLSD scores. On the other hand, those with a high school or university degree (p: 0.002) and those who had received diabetes-related training (p: 0.003) had significantly lower T2DMTAS scores (Table 4).

DISCUSSION

A study conducted to examine the relationship between health literacy and treatment adherence in individuals with type 2 diabetes found that individuals' health literacy and treatment adherence were at a moderate level, and a positive correlation was found between these two factors.

This study determined that individuals with type 2 diabetes had a moderate level of health literacy. Considering that individuals with low health literacy may not understand verbal and written information provided by healthcare professionals (Pourhabibi et al., 2022), this result can be considered favorable. However, considering that successful diabetes management requires advanced health literacy, and that adequate health literacy is associated with better self-care, glycemic control, and fewer complications (Ziady et al., 2025), this result is believed to be undesirable. Similarly, some studies have found that individuals with diabetes have a moderate level of health literacy (Parlak & Şahin, 2021; Nair et al., 2023). However, there are studies in the literature showing that health literacy is low (Williams & Ranganathan, 2024; İlhan et al., 2021; Hussein, Almajran & Albatineh, 2018; Tajdar et al., 2021; Nair et al., 2023). The discrepancy between the results of these studies and this one may be due to the fact that health literacy is influenced by cultural characteristics, healthcare systems, and individual experiences with diabetes management (Pourhabibi et al., 2022). For all these reasons, healthcare professionals should assess health literacy on an individual basis when caring for individuals with diabetes. Adherence to treatment is crucial for individuals with diabetes to maintain successful disease management (Williams and Ranganathan, 2024). When treatment adherence in individuals with type 2 diabetes is examined, it is observed that adherence varies across countries (Nascimento et al., 2025; Pourhabibi et al., 2022). This study found that individuals' adherence to treatment was moderate. This result is similar to the results of some studies conducted with individuals with type 2 diabetes in our country (Ülker & Olgun, 2023; Özonuk & Yılmaz, 2019; Özkaptan et al., 2019; Bila & Yılmaz, 2024) and other countries (Marinho et al., 2018; Pourhabibi et al., 2022). However, high adherence was found in one study (Pourhabibi et al., 2022), while low adherence was found in our country (Çorak & Uysal, 2022) and in a meta-analysis (Williams & Ranganathan, 2024). This difference between studies may be due to the cultural characteristics of the samples. Indeed, it has been reported that differences in treatment adherence may arise from cultural characteristics, beliefs, individual and racial differences, and psychosocial factors (Pourhabibi et al., 2022). Based on this information, it is believed that treatment adherence should be examined separately across individuals and societies. Low health literacy is cited as an important factor affecting treatment adherence (Pourhabibi et al., 2022). In this study, it was found that as health literacy increases, treatment adherence increases. Furthermore, the findings also determined that health literacy is one of the factors affecting treatment adherence. The result demonstrates the importance of health literacy in better disease management. Indeed, it is reported in the literature that health literacy strengthens individuals' knowledge, motivation, and decision-making skills regarding treatment, and this increases compliance with both medication use and lifestyle changes, thereby ensuring treatment adherence (Pourhabibi et al., 2022; Rodrigues et al., 2024). Similarly, this result is consistent with the results of some studies (Özonuk & Yılmaz, 2019; Pourhabibi et al., 2022; Miller, 2016; Williams & Ranganathan, 2024; Roshan et al., 2021; Eşki & Baysal, 2022). Although this descriptive study did not investigate causality, the relationship between health literacy and treatment adherence supports the literature's finding that low health literacy may be an obstacle to effective treatment adherence in controlling type 2 diabetes (Pourhabibi et al., 2022; Eşki & Baysal, 2022). Therefore, healthcare professionals should evaluate treatment adherence and health literacy

together in diabetes care. Health literacy should be prioritized, and necessary and effective counseling should be provided to increase health literacy (Hussain Said & Khan, 2020; Pourhabibi et al., 2022). When scale scores were examined according to descriptive characteristics, it was found that SOY showed a significant difference based on gender, education level, and diabetes education. This study found that women had higher health literacy scores. This result is consistent with some other studies (Ziady et al., 2025; Kolcu, Bulbul & Celik, 2023). This result may be due to women's higher utilization of healthcare services due to their traditional role as caregivers in society, such as caring for children, spouses, and elderly family members. This interaction with and utilization of the healthcare system leads to increased awareness and knowledge about health (Ziady et al., 2025), which may explain women's higher health literacy. Indeed, women have been found to use healthcare services at a higher rate and may have more experience navigating the healthcare system (Ngoatle et al., 2023). On the other hand, studies conducted both in our country (Özonuk & Yılmaz, 2019) and in different cultures have shown that health literacy is higher in men (Pourhabibi et al., 2022; Nair et al., 2023; Mohammadi et al., 2015; Roshan et al., 2023; Awad et al., 2018). Furthermore, some studies have shown that gender does not affect health literacy (Özcan & Özkahraman, 2021; Parlak & Şahin, 2021). When all these results are evaluated, it can be seen that there is an inconsistency in the literature regarding health literacy in terms of gender. When scale scores were examined according to descriptive characteristics in the study, it was found that SOY showed significant differences according to gender, level of education, and status of diabetes education. This may be due to both the changing role of women in societies and the variability of health literacy according to country, cultural, and sample characteristics. For this reason, it is thought that health literacy should be evaluated according to regional and cultural characteristics and that there is a need for research on the subject (Nair et al., 2023; Ngoatle et al., 2023). On the other hand, the study found that health literacy was higher in those with higher education levels. Similar results are also seen in other studies (Özonuk & Yılmaz, 2019; Özcan & Özkaraman, 2021, Ziady et al., 2025). It is believed that as individuals' education level increases, their reading comprehension improves, they can access health-related information more easily, and they can more easily understand and analyze the information they receive (Özcan & Özkaraman, 2021).

The study found that more than half of individuals with diabetes had not received any training on diabetes, and those who did not receive diabetes education had significantly lower health literacy levels. This result is similar to the results of some other studies (Kolcu, Bulbul & Celik, 2023; Nigussie et al., 2024; Güner, Kuzu & Bayraktaroğlu, 2020). These results indicate that healthcare professionals need to work harder on training and counseling. This is because it has been reported that education provided by healthcare professionals will increase the health literacy levels of individuals with diabetes (Pourhabibi et al., 2022; Kolcu, Bulbul & Celik, 2023). These results and information demonstrate that education provided by healthcare professionals increases health literacy and that the education and counseling services provided by healthcare team members are very important. Adherence to treatment, another scale score examined in this study, was found to differ significantly according to variables such as education level and diabetes education. The study found that those with higher education levels had better treatment adherence. This result is similar to the results of another study (Özonuk & Yılmaz, 2019). Diabetes education is important for treatment adherence in individuals with diabetes. (Pourhabibi et al., 2022). This study found that individuals who received diabetes education had higher treatment adherence than those who did not. This result is similar to the results of another study (Güner, Kuzu & Bayraktaroğlu, 2020). This result demonstrates the importance of education provided by healthcare professionals in improving treatment adherence. Considering the impact of education on health literacy, it is crucial for healthcare professionals to seize every opportunity to provide diabetes education to individuals, whether spontaneously or in a planned manner.

CONCLUSION

The study concluded that the health literacy and treatment adherence of individuals diagnosed with type 2 diabetes were at a moderate level, and there was a positive and significant relationship between the two variables. Age and education level were found to significantly impact health literacy, while education level and diabetes education led to significant differences in the mean treatment adherence scores. This result demonstrates the need to improve health literacy and treatment adherence. The positive correlation between health literacy and treatment adherence suggests that any type of training and counseling that enhances health literacy can positively contribute to improving individual treatment adherence. Considering the importance of health literacy and treatment adherence in diabetes management, nurses are recommended to assess each individual's health literacy and treatment adherence when caring for individuals diagnosed with type 2 diabetes, and to develop appropriate strategies to improve these factors by considering age, education level, and educational background.

Conflict of Interest

There are no potential conflicts of interest.

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