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*An investigation of the diabetes health literacy level and compliance to the treatment in patients with diabetes in Turkey

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ABSTRACT

Aim: This study aims to investigate the relationship between the diabetes health literacy level and compliance to the treatment in individuals with diabetes.

Material and Method: This descriptive study was conducted in the Internal Diseases-1 and Endocrinology clinics of a hospital between January 2019 and April 2020. The target population was the patients who were hospitalized in these clinics due to Type-II diabetes between the dates when data were collected. Sampling was performed using the sampling method with a known population, and the sample was composed of 237 patients. Data were collected through the Socio-demographic Form, the Diabetes Health Literacy Scale, and the Scale for Compliance to the Treatment in Type II Diabetes Mellitus. Data analysis included Kolmogorov Smirnov test, numbers, percentages, Cronbach's Alpha, t-test, Kruskal Wallis, analysis of variance, chi-square test, and correlation test.

Result: This study found the health literacy scale total mean score as above-average (38.41±8.59), and the compliance to the treatment mean score as moderate (83.14±12.35). A negative and significant relationship was found between compliance to the treatment and diabetes health literacy scale total score and the communicative health literacy and critical health literacy mean scores ($p<0.001$). In line with the results of the study, compliance to the treatment in patients with diabetes increases as their diabetes health literacy increases.

Conclusion: It is recommended to provide individuals who have diabetes with trainings for increasing their diabetes health literacy levels to increase their compliance to the treatment.

Keywords: Chronic diseases, health literacy, diabetes mellitus, compliance, treatment

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INTRODUCTION

The World Health Organization defines health literacy (HL) as "the ability of individuals to "gain access to, understand and use health information using cognitive and social skills in ways which promote and maintain good health" (1). Health literacy affects health positively by enabling individuals to obtain knowledge about diseases, maintain self- care, and make decisions about their health. An analysis of the worldwide prevalence of health literacy shows that the number of adults who do not have a basic health literacy level is composed of 16% of the world population (2). According to the National Assessment of Adult Literacy in the USA, the health literacy level of the adult population in America was reported to be insufficient for 36% and basic for the 22% (3). Studies conducted in Turkey show that insufficient health literacy ranged from 13.1% to 55.4%, problematic health literacy ranged from 22.4% to 40.1%, sufficient health literacy ranged from 16.4% to 32.9%, and excellent health literacy ranged from 5.8% to 14.5% (4-6). A study on patients with diabetes reported that diabetes health literacy was insufficient for 1%, problematic for 12.4%, sufficient for 31.4%, and excellent for 55.2% (7).

Diabetes, with its increasing prevalence every day, is one of the chronic diseases that need to be fought off (8). The Turkish Diabetes Epidemiology (TURDEP-2) report indicates that the prevalence of diabetes increased at a proportion of 90% by increasing from 7.2% to 13.7% in 12 years (1998-2010) (9). Success in the management of chronic diseases depends on individuals' taking their own health responsibility (10). One of the primary purposes of effective individual disease management is maintaining compliance to the treatment. Compliance to the treatment

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means that the individual takes the prescribed treatment as it is recommended, at appropriate times and doses, and continues doing so in the period indicated (11). Non-compliance to the treatment is a common problem in individuals with diabetes, which prevents the efficiency of the treatment, affects the course of the disease negatively, and causes an increase in health expenditures as well as in death rates due to adding other diseases to the existing one (12). Health literacy level, one of the many factors affecting compliance to the treatment, is of more importance as it can be changed and improved (13).

The number of studies indicating the effect of health literacy level on the management of diabetes has been increasing recently (7,14). In our country, there is a limited number of studies on this issue.

MATERIAL AND METHOD

This study aims to investigate the relationship between the health literacy level and compliance to the treatment in patients with diabetes in our country.

Study Design, Setting and Ethics

This across-sectional descriptive study was conducted in the Internal Diseases and Endocrinology clinics of a hospital in Erzurum, Turkey.

This study was approved by Atatürk University Faculty of Medicine Clinical Research Ethics Committee (Date: 29/11/2018, Decision No: 31) and institutional approval from Provincial Health Directorate were obtained for this study. Volunteerism was taken into consideration in the determination of participants, and all procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Participants and Setting

The target population was the patients who were hospitalized due to Type-II diabetes between the dates (January 2019-July 2019) when data were collected. Sampling was performed through the sampling method with a known population using the number of patients hospitalized in these clinics within the past one year (393 patients). The number of patients to be recruited from the clinics was identified by multiplying the sample size with the weight of strata (61 patients from the Internal Diseases clinic and 176 patients from the Endocrinology clinic).

The sample included patients who were literate, who could communicate, who were 18 and over, and who were diagnosed with Type-II diabetes at least one year ago. The patients were included in the study until the sample size was achieved; hence, the sample was composed of 237 patients who met the research criteria and agreed to participate in the study.

Variables and Data Collection

Data were collected through the Socio-demographic Form, the Diabetes Health Literacy Scale and the Scale for Compliance to the Treatment in Type II Diabetes Mellitus (DM) between January 2019 and July 2019 by conducting face to face interviews administered by the researcher. The patients were informed about the purpose of the study, and their informed consent was received. Data collection took about 15 to 20 minutes for each patient.

The Socio-demographic Form: The form developed by the researcher in line with the related literature was composed of nine questions (15).

The Diabetes Health Literacy Scale: The scale was developed by Ishikawa et al. (14) in 2008. Its validity and reliability were performed by Ağralı and Akyar 2008 (16). The scale has 14 items and 3 sub-scales that are responded on a 4-point Likert scale. The purpose of the scale is to measure the functional, communicative, and critical health literacy levels of individuals with diabetes. The 5-item functional health literacy measures the extent of the problems experienced by individuals when they read the explanations and booklets received from pharmacies and hospitals. Each item is scored as 1 (never), 2 (rarely), 3 (sometimes), and 4 (frequently). In the critical and communicative health literacy sub-scales, there is a directly proportional relationship between the health literacy level and the score while in the functional health literacy sub-scale there is an inversely proportional relationship between the health literacy level and the score. A higher functional health literacy score indicates that health literacy is more problematic in that specific domain. Cronbach's alpha coefficient of the scale is 0.78. Functional, communicative, and critical health literacy Cronbach's Alpha coefficients are 0.84, 0.77, and 0.65 respectively. Cronbach's alpha coefficient was found 0.84 in this study. The functional, communicative, and critical health literacy Cronbach's alpha values are 0.87, 0.80 and 0.88 respectively.

The Scale for Compliance to the Treatment in Type II Diabetes Mellitus: The 30-item scale developed by Demirtaş and Albayrak had 7 sub-scales rated on a 5-point scale (17). The scores to be obtained from the scale range between 30 and 150. The scores obtained are interpreted using the total scale scores. Scores between 30 and 54 indicate a "good level of compliance to the treatment", scores between 55 and 125 indicate a "moderate level of compliance to the treatment", and scores between 126 and 150 indicate a "poor level of compliance to the treatment". There is an inversely proportional relationship between the sub-scale scores and the demonstration of the expected behaviors. In other words, higher scores obtained from the scale indicate decreased compliance to the treatment. Cronbach's alpha coefficient of the scale is 0.77. This study found Cronbach's alpha coefficient as 0.70.

Statistical Analysis

Data obtained from the study were analyzed using SPSS 20 package programming on the computer. Analyses included Kolmogorov Smirnov test, numbers, percentages, Cronbach's Alpha, t-test, Kruskal Wallis, analysis of variance, chi-square test, and correlation test. P-valueslessthan 0.05 were considered statistically significant.

RESULTS

An analysis of the participants' demographic features showed that the average age was 54.63±9.48, the majority of the participants was male (57.4%), 56.1% lived in the city center, 54.4% graduated from primary school, 50.2% had income equal to expenses, 80.2% were married, and 65.8% had a nuclear family. Of all the participants, 64.1% had a family member with diabetes and 35.5% had been diagnosed with diabetes for more than 10 years.

The mean score that the participants received from the diabetes health literacy scale was 38.41±8.59. In addition, the Functional HL sub-scale mean score was 14.28±4.49, the communicative HL sub-scale mean score was 13.25±3.97, and the Critical HL sub-scale mean score was 10.87±3.70 (**Table 1**).

Table 1. Distribution of the participants' Diabetes HL Scale mean scores

Diabetes health literacy scale	Number of items	X±SD	Min-Max
Functional HL	5	14.28±4.49	5-20
Communicative HL	5	13.25±3.97	5-20
Critical HL	4	10.87±3.70	4-16
Total	14	38.41±8.59	14-16

The comparison of the participants' socio-demographic features and Diabetes HL scale mean scores showed that the functional and communicative HL sub-scale mean scores were lower in those who had an education level of university and above, and the difference between the groups was found to be statistically significant ($p<0.05$). The participants who had income more than expenses were found to have significantly lower functional HL mean scores, and the difference between the groups was statistically significant (**Table 2**) ($p<0.05$). A comparison of the participants' HL scale mean scores according to gender, the place where they lived the longest period, having a family member with diabetes, and the duration of diagnosis showed that the difference between the groups was not statistically significant (**Table 2**) ($p>0.05$).

Table 2. Comparison of the participants' Diabetes HL Scale Mean Scores according to their descriptive characteristics

Characteristics	n	Functional HL	Communicative HL	Critical HL	Total
Gender					
Female	101	14.56±4.24	13.36±3.78	11.23±3.60	39.16±7.79
Male	136	14.07±4.68 t=0.830 p=0.407	13.17±4.12 t=0.363 p=0.717	10.60±3.77 t=1.304 p=0.193	37.85±9.12 t=1.167 p=0.245
Place where they lived the longest period					
Village	59	15.23±4.50	12.67±4.03	10.45±3.87	38.37±8.75
Town	45	14.62±4.15	13.22±3.74	10.80±3.28	38.64±5.79
City	133	13.74±4.56 F=2.437 p=0.090	13.52±4.02 F=0.932 p=0.395	11.08±3.77 F=0.589 p=0.556	38.35±9.33 F=0.020 p=0.980
Education level					
Primary school	129	14.93±4.51	12.39±3.77	10.41±3.74	37.75±8.53
Secondary school	46	13.76±4.89	13.67±3.87	10.91±3.87	38.34±9.25
High school	50	13.82±3.84	14.42±3.89	11.58±3.29	39.82±7.66
University and above	12	11.16±3.92 KW=10.054 p=0.018	16.08±4.46 KW=18.211 p=0.000	12.66±3.77 KW=6.934 p=0.074	39.91±10.37 KW=2.559 p=0.465
Income level					
Income less than expenses	101	15.09±4.26	13.12±3.99	10.87±3.93	39.09±8.25
Income equal to expenses	109	13.83±4.73	13.29±4.01	10.78±3.60	37.91±9.13
Income more than expenses	17	12.58±3.22 KW=7.531 p=0.023	13.76±3.76 KW=0.205 p=0.902	11.47±3.14 KW=0.311 p=0.856	37.82±6.41 KW=1.602 p=0.449
Marital status					
Married	190	14.44±4.43	13.31±4.08	10.95±3.76	38.71±8.67
Single	47	13.61±4.72 t=1.133 p=0.258	13.04±3.51 t=0.413 p=0.680	10.53±3.50 t=0.704 p=0.482	37.19±8.22 t=1.090 p=0.277
Family type					
Nuclear family	156	14.19±4.67	13.05±4.07	10.68±3.82	37.93±9.04
Extended family	81	14.44±4.15 t=0.398 p=0.691	13.65±3.76 t=1.108 p=0.269	11.23±3.47 t=1.080 p=0.281	39.33±7.61 t=1.189 p=0.236
Family member with diabetes					
Yes	152	14.47±4.23	13.51±4.11	11.19±3.58	39.17±8.26
No	85	13.94±4.94 t=0.873 p=0.383	12.80±3.69 t=1.326 p=0.186	10.30±3.87 t=0.117 p=0.078	37.04±9.02 t=0.351 p=0.067
Duration of diagnosis					
1-4 years	70	13.68±4.61	12.81±4.15	10.48±3.96	36.98±9.31
5-9 years	83	13.96±4.38	13.75±3.77	11.30±3.43	39.02±8.07
10 years and over	84	15.09±4.44 F=2.217 p=0.111	13.13±4.00 F=1.139 p=0.322	10.77±3.74 F=0.964 p=0.383	39.00±8.42 F=1.377 p=0.254

Table 3. Distribution of the participants' mean scores of the Scale for Compliance to the Treatment in Type II DM

Compliance to the treatment	Number	Percentage	X±SD	Min-Max
Good (30-54)	4	1.7	52.75±1.50	51-54
Moderate (55-125)	233	98.3	83.66±11.79	56-108
Poor (126-150)	0	0	0	0-0
Total	237	100	83.14±12.35	51-108

Table 4. Comparison of the scale for compliance to treatment in type-II DM according to the participants'descriptive characteristics

Characteristics	n	Scale for compliance to the treatment in type II DM total mean score
Gender		
Female	101	82.78±11.86
Male	136	83.41±12.74 t=0.387 p=0.699
Place where they lived the longest period		
Village	59	84.62±13.25
Town	45	84.51±12.38
City	133	82.02±11.90 F=1.251 p=0.280
Education level		
Primary school	129	83.20±12.85
Secondary school	46	84.50±11.20
High school	50	83.64±11.60
University and above	12	75.16±12.64 KW=5.455 p=0.141
Income level		
Income less than expenses	101	85.10±13.61
Income equal to expenses	109	81.77±10.77
Income more than expenses	17	81.05±13.93 KW=5.701 p=0.058
Marital status		
Married	190	83.66±12.14
Single	47	81.02±13.08 t=1.307 p=0.189
Family type		
Nuclear family	156	81.84±12.75
Extended family	81	85.64±11.19 t=2.263 p=0.025
Having a family member with diabetes		
Yes	152	83.79±12.33
No	85	81.97±12.38 t=1.088 p=0.278
Duration of diagnosis		
1-4 years	70	82.38±13.66
5-9 years	83	83.60±11.91
10 years and over	84	83.32±11.74 F=0.196 p=0.822

An analysis of the distribution of the participants' mean scores in the Scale for Compliance to the Treatment in Type II DM showed that the mean score obtained from the Scale for Compliance to the Treatment in Type II DM was 83.14±12.35 (**Table 3**).

When the participants' total mean scores of the Scale for Compliance to the Treatment in Type II DM were analyzed according to their descriptive features, it was found that the participants who lived in a nuclear family received lower mean scores, and the difference between the groups was statistically significant (**Table 4**) ($p<0.05$). The comparison of the participants' mean scores of the Scale for Compliance to the Treatment in Type II Diabetes Mellitus according to gender, the place where they lived the longest period, education level, marital status, and having a family member with diabetes indicated no statistically significant differences between the groups ($p>0.005$).

A negative, significant relationship was found between the Scale for Compliance to the Treatment in Type II Diabetes Mellitus and Diabetes HL Scale communicative and critical sub-scale and total mean scores ($p<0.001$) (**Table 5**).

DISCUSSION

The findings of this study, which aimed to identify the relationship between the health literacy level and compliance to the treatment in patients with diabetes, are discussed with limited literature due to the limited number of studies on this issue in our country.

This study found the Diabetes Health Literacy Scale total mean score as 38.41±8.59. The scores range between 14 and 56, and higher scores indicate higher health literacy levels. Based on these results, the health literacy level of the participants in this study was found to be above-average. Another study that utilized a different tool for identifying diabetes literacy including individuals with diabetes reported the diabetes health literacy mean score as 36.82, indicating a moderate level (7).

This study detected no significant relationships between the functional, communicative, and critical health literacy. A study that utilized the same measurement tool similarly reported no significant relationships between diabetes literacy sub-scales and gender (14). No significant relationship was found between the place where they

Table 5. The relationship between the participants' mean scores in the scale for compliance to the treatment in Type II diabetes mellitus and diabetes HL

Scales	Diabetes HL Scale			
	Functional HL	Communicative HL	Critical HL	Total
The scale for compliance to the treatment in type II diabetes mellitus	r=0.066 p=0.310	r=-0.236 p=0.000	r= -0.262 p=0.000	r=-0.188 p=0.004

lived the longest period and diabetes health literacy, but the scores were found to be lower in villages and higher in cities. This study found no significant differences between the education level and diabetes health literacy total scale scores. On the other hand, functional health literacy and communicative health literacy levels were found to increase significantly with the increase in the education level. Although no significant differences were found between the critical health literacy and education level, it was found that the critical health literacy score increased with the increase in the education level. The literature includes no studies that utilized this scale in patients with diabetes in our country. According to the results of the European Health Literacy Survey, a directly proportional relationship was noted between the general education level and health literacy score (18). Another study reported that starting from adults who graduated from highschool, the average health literacy level was found to increase with each higher education level (3). Although this study found no significant differences, the diabetes health literacy total scale score was found to increase with the education level. This study found a statistically significant relationship between the income level and functional health literacy; those who had income less than expenses were found to have more problematic functional HL. No statistically significant differences were found between the groups in terms of the diabetes health literacy total score, communicative health literacy and critical health literacy sub-scale mean scores. Diabetes health literacy scores of the individuals who had high-income levels were reported to be higher (14). No significant differences were reported between marital status, family structure, and duration of diabetes and health literacy sub-scales.

The participants mean score for the Scale for Compliance to the Treatment in Type II DM was found 83.14±12.35, indicating moderate level compliance. Scores between 55 and 125 indicate a moderate level of compliance to the treatment (17). Another study similar to the present one showed that the mean score for the Scale of Compliance to the Treatment in Type II DM was 107.39±13.55, indicating moderate-level compliance (19). Of all the participating individuals, 98.3% had a moderate level of compliance to the treatment. While the present study involved no participants who had poor compliance to the treatment, 1.7% was found to have good compliance to the treatment. Kav and Bulut, similar to the present study, found that 97.4% of the individuals participating in their study had a moderate level of compliance to the treatment (20). While there were no individuals who had poor compliance to the treatment, the proportion of those who had good compliance was found 2.6%. Review of the related literature indicates differences in the levels of compliance to the treatment among patients with diabetes. In their meta-analysis, Kras et al. (21) reported the compliance to the drug between 38.5% and 93%. Unlike the findings of the present study, some studies conducted in other countries reported high levels of compliance to the treatment among patients. This condition might have resulted from the differences in the health services received by patients as well as the differences in the measurement tools used to measure compliance. As a result, it could be noted that our country needs new practices to increase compliance to the treatment of diabetes.

When the patients' descriptive characteristics and their compliance to the DM treatment were compared, only the family type variable was found to demonstrate significant differences; no significant differences were found between the other variables. Although the DM compliance was higher in women, in those who lived in a city, who had higher education levels, who had income more than expenses, and who were single, no significant differences were found between the groups. Kim et al. (22) also found no significant differences between gender and compliance to the treatment. Kav and Bulut (20) similarly indicated that compliance to the DM treatment was higher in women, in those who lived in a city, who had higher education level, who had income more than expenses, and who were single, but the differences between the groups were not statistically significant. University graduates' compliance to the treatment was found to be better (23). A study conducted in Egypt reported that compliance to the treatment increased with the increase in education level (24). Unlike these studies in the literature reporting an increase in the compliance to the treatment with the increase in education level, some studies in the literature indicate no relationships between education level and compliance to the treatment (25). The participants who had a nuclear family structure were found to have lower scores in the Scale for Compliance to the Treatment in Type II DM, which indicated better compliance to the treatment; this difference was found to be statistically significant. This finding could be related to the fact that individuals living in a nuclear family do not have extra responsibilities such as taking care of parents and thus could spend more time on their own health and treatment. This study found no significant relationships between having a family member with diabetes and compliance to the treatment. The literature also reported no significant relationship between having a family member with diabetes and compliance to the treatment (26). This study found no significant relationship between the duration of diagnosis and compliance to the treatment. A study found that 71.8% of the individuals with more than 19 years of disease duration had good compliance to the treatment (26). Kav and Bulut also reported no significant relationship between the duration of diagnosis and compliance to the treatment (20).

This study found a negative, weak relationship between the diabetes health literacy total scale score, communicative health literacy, and critical health literacy, and compliance to the treatment mean score. In other words, although the relationship is not strong, compliance to the treatment increases with the increase in diabetes health literacy scale total score and communicative and critical health literacy scores. This finding indicates the positive effect of health literacy on compliance to the treatment. Individuals with good diabetes health literacy levels have important opportunities in terms of arranging the insulin dose, interpreting the meaning of blood glucose results, knowing which food to eat or not to eat, counting carbohydrate, and managing the use of drugs like insulin, which could be considered to contribute to the compliance to the chronic disease of diabetes. Similar to the results of the present study, Lai et al. (27) reported a positive, significant relationship between the communicative and critical health literacy and diabetes self-care management while no relationships were found between functional health literacy and diabetes self-care. Another study also reported an increase in individuals' compliance to the treatment with an increase in their health literacy level(24). Studies on individuals with diabetes showed that low health literacy levels had negative effects on compliance to the treatment (28,29). Unlike the present study, Kim et al. (22) reported that individuals with low health literacy demonstrated better compliance to their diet, individual blood glucose follow-ups, and foot care. In addition, another study also reported no relationships between health literacy and compliance to the treatment (30). The reason for these differences between the study findings could be the differences in the sample sizes.

This study found that individuals with high diabetes health literacy showed better compliance to the treatment. In other words, individuals who understand the health information better, who can read and understand the explanations of health professionals and medical training booklets better, and who do not experience communication problems affecting the disease were found to receive the treatment as they are recommended, at appropriate times and doses; namely, their compliance to the treatment was better.

CONCLUSION

This study found the health literacy level as above-average (38.41±8.59) and compliance to the treatment as moderate (83.14±12.35). Income level and education level among the descriptive features were found to affect functional health literacy. This study found that individuals who had a nuclear family structure demonstrated better compliance to the treatment. It was also found that patients with high health literacy levels demonstrated better compliance to the treatment.

In line with these results, as compliance to the treatment was better in patients who had higher diabetes health literacy levels, it could be recommended to increase the patients' diabetes health literacy level with the help of nurses. Nurses should also provide illiterate patients or patients who have low literacy levels and elderly patients with trainings for increasing their health literacy levels. It is also recommended that other factors affecting compliance to the treatment should be investigated.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by Atatürk University Faculty of Medicine Clinical Research Ethics Committee (Date: 29/11/2018, Decision No: 31).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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