

ARAŞTIRMA MAKALESİ/RESEARCH ARTICLE

EVALUATION OF DIABETES AWARENESS, EMOTIONAL STATE, SELF-EFFICACY LEVELS, AND ANTHROPOMETRIC MEASUREMENTS IN INDIVIDUALS WITH TYPE 2 DIABETES

TİP 2 DİYABETLİ BİREYLERDE DİYABET FARKINDALIĞI, DUYGUSAL DURUM, ÖZ YETERLİLİK DÜZEYLERİ VE ANTROPOMETRİK ÖLÇÜMLERİN DEĞERLENDİRİLMESİ

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ABSTRACT

Aim: Diabetes is a serious chronic disease characterized by impaired carbohydrate, fat, and protein metabolism resulting from insufficient insulin production or ineffective insulin utilization. This study aimed to assess diabetes awareness, emotional state, and self-efficacy levels in individuals with type 2 diabetes.

Materials and Methods: This cross-sectional study was conducted between January and September 2024 at the Hacettepe University Faculty of Medicine Adult Hospital, General Internal Medicine Outpatient Clinic. The sample included 218 volunteers (87 males, 131 females) aged 20–65 years with a diagnosis of type 2 diabetes. Data were collected through a questionnaire assessing general characteristics and nutritional habits, along with the Diabetes Awareness and Acceptance Scale (DAAS), Difficulties in Emotion Regulation Scale-Short Form (DERS-16), and Self-Efficacy Scale for Type 2 Diabetics (DMSES). Anthropometric and body composition measurements were recorded, while biochemical data were obtained from patient records. Statistical analyses examined relationships among the variables.

Results: Overweight and obesity were highly prevalent among participants, with significant differences between genders. Women had higher awareness subscale scores and greater emotion regulation difficulty scores than men. Individuals with higher

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Hemoglobin A1c (HbA1c) levels showed greater awareness and acceptance scores, and a significant relationship was observed between awareness/acceptance and glycemetic control.

Conclusion: Higher awareness and acceptance levels may contribute to improved glycemetic control by promoting positive health behaviors such as healthy eating and treatment adherence. Educational and psychosocial interventions aimed at enhancing awareness may support better blood glucose management.

Keywords: Type 2 Diabetes, Diabetes Awareness, Emotional State, Self-Efficacy Levels

ÖZET

Amaç: Diyabet, pankreasın yeterli miktarda insülin üretememesi veya üretilen insülinin vücut tarafından etkili şekilde kullanılamaması sonucunda karbonhidrat, yağ ve protein metabolizmasının bozulmasıyla karakterize ciddi ve kronik bir hastalıktır. Bu çalışma, tip 2 diyabetli bireylerde diyabet farkındalığı, duygusal durum ve öz yeterlilik düzeylerini değerlendirmeyi amaçlamıştır.

Gereç ve Yöntem: Bu kesitsel çalışma, Ocak–Eylül 2024 tarihleri arasında Hacettepe Üniversitesi Tıp Fakültesi Erişkin Hastanesi Genel İç Hastalıkları Polikliniği'nde gerçekleştirilmiştir. Çalışma örneklemini, tip 2 diyabet tanısı almış, yaşları 20–65 arasında değişen ve çalışmaya katılmaya gönüllü 218 birey (87 erkek, 131 kadın) oluşturmuştur. Veriler; genel özellikler ve beslenme alışkanlıklarını içeren bir anket formu ile Diyabet Farkındalık ve Kabullenme Ölçeği (DFKÖ), Duygu Düzenleme Güçlüğü Ölçeği-Kısa Formu (DDGÖ-16) ve Tip 2 Diyabetliler İçin Öz Yeterlilik Ölçeği (DMSES) kullanılarak toplanmıştır. Antropometrik ve vücut bileşimi ölçümleri kaydedilmiş, biyokimyasal veriler hasta kayıtlarından elde edilmiştir. Değişkenler arasındaki ilişkiler istatistiksel yöntemlerle değerlendirilmiştir.

Bulgular: Katılımcılar arasında fazla kiloluluk ve obezite prevalansının yüksek olduğu, ayrıca cinsiyetler arasında anlamlı farklılıklar bulunduğu belirlenmiştir. Kadınların farkındalık alt boyutu puanları ve duygu düzenleme güçlüğü toplam puanları erkeklerden daha yüksek bulunmuştur. Hemoglobin A1c (HbA1c) düzeyi yüksek olan bireylerin farkındalık ve kabullenme puanlarının daha yüksek olduğu ve farkındalık/kabullenme ile glisemik kontrol arasında anlamlı bir ilişki bulunduğu saptanmıştır.

Sonuç: Daha yüksek farkındalık ve kabullenme düzeyleri, sağlıklı beslenme ve tedaviye uyum gibi olumlu sağlık davranışlarını destekleyerek daha iyi glisemik kontrol



sağlayabilir. Farkındalığı artırmaya yönelik eğitim ve psikososyal destek programları, kan glukoz düzeylerinin yönetiminde etkili stratejiler olabilir.

Anahtar kelimeler: Tip 2 Diyabet, Diyabet Farkındalığı, Duygusal Durum, Öz Yeterlilik Düzeyleri

INTRODUCTION

Diabetes is a serious, complex, and chronic disease that leads to impaired metabolism of carbohydrates, fats, and proteins, resulting from the pancreas's failure to produce sufficient insulin or the body's inability to effectively utilize the insulin produced (1,2). According to the Global Report on Diabetes prepared by the World Health Organization (WHO), the prevalence of diabetes among adults has nearly doubled since 1980, rising from 4.7% to 8.5% (3). According to the International Diabetes Federation (IDF) 11th Diabetes Atlas, it is estimated that while one in every nine adults (589 million individuals) aged 20–79 will have diabetes in 2025, this number will increase to 853 million by 2050. Additionally, it is stated that diabetes accounts for at least 1 trillion USD in global health expenditures, representing a 338% increase over the last 17 years (4). In line with the TURDEP-I (Turkey Diabetes, Hypertension, Obesity, and Endocrinology Prevalence Study) and TURDEP-II studies conducted in our country, the prevalence of diabetes among adults aged 20 and over in Turkey has increased by 90.0% within 12 years, rising from 7.2% to 13.7% (5). Type 2 diabetes is a complex disease that occurs in approximately 90-95% of individuals with diabetes and develops along with cardiovascular and metabolic complications (6,7). According to the International Diabetes Federation, diabetes is a disease that can lead to serious health problems, but it can be prevented or delayed by adopting an active and healthy lifestyle. The management of Type 2 diabetes is also extremely important. Maintaining a healthy diet, regular exercise, smoking cessation, and preserving an ideal body weight are fundamental factors in controlling Type 2 diabetes (2).

Individuals with diabetes are compelled to make significant lifestyle changes following their diagnosis. This situation affects the individual both emotionally and physically, which complicates the process of disease acceptance. Accepting the disease leads to a reduction in the individual's negative emotions and thoughts, thereby facilitating the coping process. In the literature, it is observed that the level of disease acceptance varies



according to the individual's biopsychosocial status (8). In a study conducted with individuals with Type 1 and Type 2 diabetes, it was found that those with lower levels of diabetes acceptance had lower coping skills, decreased self-care levels, higher HbA1c levels, increased diabetes-related anxiety, and more pronounced depressive symptoms (9).

Emotion regulation is a comprehensive process that influences an individual's emotional state and the factors associated with these emotions (10). A previous study observed that emotion regulation is associated with diminished diabetes self-care behaviors (11). For the effective management of diabetes, it is a crucial factor for individuals to acquire sufficient knowledge, skills, and experience regarding self-care and medical treatment (12). In this process, the individual's level of self-efficacy is vital. Self-efficacy refers to an individual's capacity to successfully perform a specific task and maintain control over it; it is also defined as the ability of an individual to make decisions on how to cope with a situation (13). In the literature, an increase in self-efficacy has been associated with favorable changes in HbA1c levels and improved glycemic control (14).

This study aims to evaluate the levels of diabetes awareness, emotional state, and self-efficacy in individuals with Type 2 diabetes aged 20–65 who applied to the General Internal Medicine Outpatient Clinic of Hacettepe University Faculty of Medicine Adult Hospital.

MATERIAL AND METHODS

The required sample size was calculated using G*Power software (version 3.1.9.7). An a priori power analysis was conducted based on a medium effect size ($d = 0.25$), an alpha level of 0.05, and a target power ($1-\beta$) of 0.95. The analysis indicated that a minimum total sample size of 210 was required. To ensure statistical reliability and account for potential data loss, the study was completed with 218 participants, achieving an actual power of 0.96.

Participants were selected using a non-probability convenience sampling method from patients who applied to the General Internal Medicine Outpatient Clinic of Hacettepe University Faculty of Medicine Adult Hospital. All individuals who met the inclusion criteria during the study period and provided informed consent were included in the sample.



This cross-sectional study was conducted between January 2024 and September 2024 at the Hacettepe University Faculty of Medicine Adult Hospital, General Internal Medicine Outpatient Clinic. The study sample consisted of 218 volunteers (87 males, 131 females) aged 20–65 years, all of whom were diagnosed with Type 2 diabetes and provided informed consent.

Eligibility Criteria

Inclusion Criteria:

- Being diagnosed with Type 2 Diabetes Mellitus,
- Aged between 20 and 65 years,
- Being literate (to ensure the comprehension and signing of the informed consent form),
- Individuals using or not using oral antidiabetic medication and/or insulin therapy,
- Volunteering to participate in the study.

Exclusion Criteria:

- Having a diagnosed psychiatric disorder,
- Being diagnosed with cancer,
- Being diagnosed with Type 1 Diabetes Mellitus,
- Being pregnant or in the lactation period,
- Having chronic renal or hepatic disease,
- Declining to participate in the study.

Data Collection and Measures Data were collected through face-to-face interviews using a structured questionnaire developed by the researchers. The questionnaire assessed participants' sociodemographic characteristics (e.g., marital status, educational level), general health status, and dietary habits. Furthermore, psychological and behavioral constructs were evaluated using the following validated instruments: the Diabetes Acceptance and Awareness Scale (DAAS), the 16-item Difficulties in Emotion Regulation Scale-Short Form (DERS-16), and the Self-Efficacy Scale for Type 2 Diabetes.

Anthropometric and Body Composition Assessment Anthropometric measurements were recorded for all participants. Body composition was assessed via bioelectrical impedance analysis (BIA) using the Tanita Body Composition Analyzer BC-418.



Routine HbA1c levels were retrieved from the participants' medical records. Individuals with psychiatric disorders, hearing or speech impairments, pregnant or lactating women, and patients diagnosed with Type 1 diabetes, cancer, or chronic renal and hepatic diseases were excluded from the study.

Ethical approval was obtained from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (Decision No: 10, Date: January 23, 2024). All participants were informed about the nature and purpose of the study, and written informed consent was obtained from those who volunteered to participate prior to their inclusion.

Anthropometric Assessment

Participants' body weight and body composition were assessed via bioelectrical impedance analysis (BIA) using the TANITA BC-418 device. Body fat percentage and muscle mass were analyzed based on the difference in electrical conductivity between lean tissue mass and adipose tissue (15). Height (cm), body weight (kg), waist circumference (cm), and hip circumference (cm) were measured by the researcher following the standardized anthropometry protocols. Measurements were conducted while participants were in a fasting state, wearing light clothing, barefoot, and free of any metal jewelry or objects. Height was measured using a stadiometer to the nearest 0.1 cm, and circumferences were assessed with a non-stretchable tape measure at the end of a normal expiration (16). Based on these data, Body Mass Index (BMI) and waist-to-hip ratio were calculated. BMI values were categorized according to the World Health Organization (WHO) classification (16). Waist circumference values between 94–102 cm in men are classified as a risk, while values ≥ 102 cm indicate high risk. In women, a waist circumference of 80–88 cm is categorized as a risk, and ≥ 88 cm is defined as high risk. Furthermore, a waist-to-hip ratio of ≥ 0.90 in men and ≥ 0.85 in women is evaluated as a risk factor (17).

Diabetes Awareness and Acceptance Scale (DAAS)

The Diabetes Awareness and Acceptance Scale (DAAS) was utilized to assess the levels of diabetes awareness and illness acceptance among the participants. The scale was developed in Turkey by Atik et al. It consists of 23 items, with total scores ranging from 23 to 115. The instrument comprises two subscales: "Awareness" (scores ranging from 14 to 70) and "Acceptance" (scores ranging from 9 to 45). Items are rated on a 5-point



Likert scale: 1 = Never, 2 = Sometimes, 3 = Undecided, 4 = Frequently, and 5 = Always. Higher total and subscale scores indicate higher levels of diabetes awareness and acceptance (18).

Difficulties in Emotion Regulation Scale-Short Form (DERS-16)

The Difficulties in Emotion Regulation Scale (DERS) was originally developed by Gratz and Roemer (19) to provide a comprehensive assessment of emotional dysregulation across multiple dimensions. This self-report instrument consists of 36 items. Subsequently, Bjureberg et al. (20) developed a revised 16-item short form (DERS-16), which was utilized in the present study. The DERS-16 comprises five subscales: clarity, goals, impulse, strategies, and non-acceptance. The validity and reliability of the Turkish version of the scale were established by Yiğit and Yiğit (21). Items are rated on a 5-point Likert scale, with response options representing the frequency of the behavior: 1 = almost never (0–10%), 2 = sometimes (11–35%), 3 = about half the time (36–65%), 4 = most of the time (66–90%), and 5 = almost always (91–100%). The total score is used for assessment, where higher scores indicate greater difficulties in emotion regulation (21).

Diabetes Management Self-Efficacy Scale (DMSES)

The Diabetes Management Self-Efficacy Scale (DMSES) was originally developed by Van der Bijl et al. (22) to evaluate the self-efficacy of individuals with diabetes regarding their self-care management. The original instrument consists of 20 items and four subscales, rated on a 5-point Likert scale. The validity and reliability of the Turkish version were first established by Yeşilbakan (23). Responses are scored as follows: "Yes, I am sure" (5 points), "Yes" (4 points), "Neither yes nor no" (3 points), "No" (2 points), and "No, I am not sure" (1 point). Higher scores indicate a higher level of self-efficacy in diabetes management (23). In 2006, Kara et al. (24) conducted a cross-cultural adaptation and identified three subscales for the Turkish version: diet and foot care (DF), medical treatment (MT), and physical exercise (PE). Total scores on the scale range from a minimum of 20 to a maximum of 100.

Statistical Evaluation of Data

Statistical analyses were performed using IBM SPSS Statistics software (version 27.0). Descriptive statistics and frequency tables were used to summarize the findings.



Continuous variables are presented as mean \pm standard deviation (SD), median, and minimum–maximum values, while categorical variables are reported as frequencies (n) and percentages (%). Parametric methods were employed for variables meeting the assumption of normal distribution. Accordingly, the Independent Samples t-test was used to compare measurement values between two independent groups, and One-Way Analysis of Variance (ANOVA) was utilized for comparisons involving three or more independent groups. In cases where significant differences were identified among three or more groups, the Tukey post-hoc test was applied for pairwise comparisons, taking the homogeneity of variances into account. Statistical significance was set at $p < 0.05$.

Non-parametric methods were employed for variables that did not meet the assumption of normal distribution. Accordingly, the Mann-Whitney U test was used for the comparison of two independent groups, while the Kruskal-Wallis H test was utilized for comparisons involving three or more independent groups. In cases where a significant difference was observed among three or more groups, the Bonferroni correction was applied for pairwise comparisons. The relationship between two continuous variables was examined using the Pearson correlation coefficient for normally distributed data, and the Spearman correlation coefficient was used when at least one of the variables did not follow a normal distribution. For all statistical analyses, the level of significance was set at $p < 0.05$.

RESULTS

The study population consisted of 39.9% (n=87) males and 60.1% (n=131) females. The mean age of the participants was 54.04 ± 8.99 years for males, 54.89 ± 9.09 years for females, and 54.55 ± 8.99 years for the total sample. The mean duration of diabetes among the individuals was 2.28 ± 1.25 years. Regarding medical treatment, 12.4% (n=27) of the participants were not receiving any medical intervention for diabetes, whereas 87.6% (n=191) were undergoing medical treatment. In terms of dietary management, 63.8% (n=139) of the participants did not follow a medical nutrition therapy (MNT) plan, while 36.2% (n=79) reported following MNT. The general characteristics of the participants are presented in Table 1.

Table 1. Distribution of General Characteristics of the Participants

Variable	Male (n=87)	Female (n=131)	Total (n=218)
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	n	%	n	%	n	%	Statistical Analysis / p-value
Education Level							
Primary School	20	23.0	73	55.7	93	42.6	$\chi^2=23.43$ p<0.001
Middle School	13	14.9	9	6.9	22	10.1	
High School or equivalent	22	25.3	22	16.8	44	20.2	
University	32	36.8	27	20.6	59	27.1	
Marital Status							
Married	77	88.5	101	77.1	178	81.7	$\chi^2=3.81$ p=0.05
Single	10	11.5	30	22.9	40	18.3	
Duration of DM							
0-4 years	41	47.1	49	37.4	90	41.3	$\chi^2=17.34$ p<0.001
5-9 years	22	25.4	13	9.9	35	16.1	
10-14 years	11	12.6	24	18.3	35	16.1	
15 years and over	13	14.9	45	34.4	58	26.5	
Mean Duration of DM (years)							
X±SS		1.96±1.10		2.50±1.30		2.28±1.25	
Type of DM Treatment							
OAD	43	55.1	69	61.1	112		$\chi^2=1.63$ p=0.44
Insulin	7	9.0	13	11.5	20	58.6	
OAD ve Insulin	28	35.9	31	27.4	59	10.5	
MNT Status							
Non-adherent	58	66.7	81	61.8	139		$\chi^2=0.53$ p=0.47
Adherent	29	33.3	50	38.2	79	63.8	
Smoking Status							
Non-smoker	59	67.8	112	85.5	171		$\chi^2=9.66$ p=0.002
Smoker	28	32.2	19	14.5	47	78.4	
Number of Main Meals							
1	2	2.3	1	0.8	3		$\chi^2=3.49$ p=0.18
2	33	37.9	65	49.6	98	1.4	
3	52	59.8	65	49.6	117	45.0	
Number of Snacks							
None	18	20.7	24	18.4	42		$\chi^2=3.2$ p=0.36
1 kez	24	27.6	48	36.6	72	19.3	
2 kez	30	34.5	33	25.2	63	33.0	
3 kez	15	17.2	26	19.8	41	28.9	
						18.8	

Note: Pearson's chi-square (χ^2) test was used for categorical variables. DM: Diabetes Mellitus, OAD: Oral Antidiabetic Drug, MNT: Medical Nutrition Therapy.

Note: Categorical variables are presented as n (%). Continuous variables are presented as Mean \pm Standard Deviation (SD). The normality of the distribution of variables was evaluated using the Kolmogorov-Smirnov test, and data showed a normal distribution.

The distribution of individuals' metabolic risk status based on their anthropometric measurements is presented in Table 2. According to Body Mass Index (BMI; kg/m²) values, 0.9% (n=2) of the participants were underweight, 10.6% (n=23) were normal weight, 34.9% (n=76) were overweight, and 53.6% (n=117) were obese/morbidly obese.



Based on waist circumference (cm) values, 72.0% (n=157) of the men were in the high-risk group, while 19.7% (n=43) were categorized as being at risk.

Table 2. Distribution of Metabolic Risk Status Based on Anthropometric Measurements

Variable	Male (n=87)		Female (n=131)		Total (n=218)		Statistical Analysis / p-value
	n	%	n	%	n	%	
BMI (kg/m²)							
Underweight (<18.50 kg/m ²)	1	1.1	1	0.8	2	0.9	$\chi^2=12.67$
Normal (18.50-24.99 kg/m ²)	11	12.6	12	9.2	23	10.6	p=0.01
Overweight (25.00-29.99 kg/m ²)	41	47.1	35	26.7	76	34.9	
Obese/Morbidly Obese (≥ 30.00 kg/m ²)	34	39.2	83	63.3	117	53.6	
Waist Circumference (cm)							
No risk	14	16.1	4	3.1	18	8.3	$\chi^2=40.67$
At risk (M: 94-102 cm, F:80-88 cm)	31	35.6	12	9.2	43	19.7	p<0.001
High risk (M: ≥ 102 cm, F: ≥ 88 cm)	42	48.3	115	87.7	157	72.0	
Waist-to-Hip Ratio							
No risk	4	4.6	9	6.9	13	6.0	$\chi^2=0.48$
At risk (E: ≥ 0.90 , K: ≥ 0.85)	83	95.4	122	93.1	205	94.0	p=0.49
Body Fat Percentage (%)							
Underweight (M: $\% \leq 8$, F: $\% \leq 15$)	1	1.1	-	-	1	0.5	$\chi^2=27.85$
Healthy (M: $\% 8$ - $\% 15$, F: $\% 15$ - $\% 22$)	4	4.6	3	2.3	7	3.2	p<0.001
Overweight (M: $\% 16$ - $\% 20$, F: $\% 23$ - $\% 26$)	19	21.9	4	3.1	23	10.6	
Obese (M: $\% 21$ - $\% 24$, F: $\% 27$ - $\% 31$)	47	54.0	109	83.2	156	71.6	
Morbid Obese (M: $\geq \% 25$, F: $\geq \% 32$)							

*Note: Pearson's chi-square (χ^2) test was used for the analysis of categorical variables. BMI: Body Mass Index, M: Male, F: Female. Underweight, overweight, and obese categories were defined according to WHO criteria.

Note: Categorical variables are presented as number (n) and percentage (%).

The evaluation of DAAS, DERS-16, and DMSES scores of individuals with Type 2 diabetes by gender is presented in Table 3. The awareness subscale scores of women were higher than those of men, and this difference was found to be statistically significant (p=0.05). The comparison of DAAS, DERS-16, and DMSES scores according to the HbA1c levels of individuals with Type 2 diabetes is shown in Table 4. Individuals with



HbA1c levels $\geq 7\%$ had significantly higher total DAAS scores ($p < 0.05$). Conversely, individuals with HbA1c levels $< 7\%$ had significantly higher scores in the non-acceptance subscale of the DAAS ($p = 0.03$).

Table 3. Evaluation of DAAS, DERS-16, and DMSES Scores by Gender

Variable	Male (n=87)	Female (n=131)	Statistical Analysis / p-value
	$\bar{X} \pm SS$	$\bar{X} \pm SS$	
DAAS			
Awareness	55.83 \pm 9.48	58.19 \pm 9.82	p=0.05
Acceptance	35.86 \pm 8.99	36.99 \pm 8.81	p=0.31
DAAS–Total	91.70 \pm 15.75	95.19 \pm 15.34	p=0.08
DERS-16			
Clarity	3.76 \pm 1.79	4.56 \pm 1.99	p=0.002
Goals	6.29 \pm 3.26	7.25 \pm 3.28	p=0.02
Impulse	4.94 \pm 2.46	5.34 \pm 2.79	p=0.38
Strategies	8.36 \pm 3.91	9.39 \pm 4.46	p=0.06
Non-acceptance	4.67 \pm 2.34	5.08 \pm 2.71	p=0.28
DERS-16 Total	28.03 \pm 11.83	31.63 \pm 12.69	p=0.01
DMSES			
Diet+Foot Care	42.31 \pm 8.99	42.58 \pm 8.40	p=0.71
Medical Treatment	20.45 \pm 3.78	20.96 \pm 2.78	p=0.67
Physical Exercise	10.72 \pm 3.02	10.46 \pm 3.17	p=0.73
DMSES–Total	73.47 \pm 13.60	74.00 \pm 11.57	t=-0.31 p=0.77

*Note: Independent Samples t-test (t) was used for normally distributed data, and Mann-Whitney U test (Z) was used for non-normally distributed data. DAAS: Diabetes Awareness and Acceptance Scale, DERS-16: Difficulties in Emotion Regulation Scale-Short Form, DMSES: Diabetes Management Self-Efficacy Scale, SD: Standard Deviation, IQR: Interquartile Range.

Note: Continuous variables are presented as Mean \pm Standard Deviation. The normality of data was assessed using the Kolmogorov-Smirnov test. Since the data showed a normal distribution, the Independent Samples t-test was used for comparisons between genders. $p < 0.05$ was considered statistically significant.



Table 4. Comparison of DAAS, DERS-16, and DMSES Scores According to HbA1c Levels

Variable	HbA1c <7% (n=78)		HbA1c ≥7% (n=140)		Statistical Analysis / p-value
	$\bar{X} \pm SS$	Median [IQR]	$\bar{X} \pm SS$	Median [IQR]	
DAAS					
Awareness	55.06±10.45	56.5 [14.5]	58.47±9.12	58.5 [11.0]	Z=-2,31 p=0.02
Acceptance	35.14±8.89	6.0 [13.3]	37.32±8.81	40.0 [11.8]	Z=-2.16 p=0.03
DAAS–Total	90.21±15.70	91,0 [22.3]	95.80±5.18	98.5 [15.0]	Z=-2.92 p=0.003
DERS-16					
Clarity	4.53±2.03	4.0 [3.0]	4.07±1.88	4.0 [3.0]	Z=-1.62 p=0.11
Goals	7.33±3.25	7.0 [4.0]	6.62±3.31	6.0 [4.0]	Z=-1.93 p=0.05
Impulse	5.35±2.56	5.0 [4.0]	5.07±2.72	4.0 [3.0]	Z=-1.24 p=0.22
Strategies	9.65±4.58	8.0 [6.0]	8.60±4.06	7.0 [5.0]	Z=-1.78 p=0.09
Non-acceptance	5.42±2.92	5.0 [3.0]	4.64±2.32	4.0 [3.0]	Z=-2.17 p=0.03
DERS-16 Total	32.30±13.04	29.0 [19.3]	29.03±12.01	25.5 [14.0]	Z=-1.95 p=0.05
DMSES					
Diet+Foot Care	41.98±9.16	43.0 [12.0]	42.74±8.32	43.0 [11.0]	t=-1.69 p=0.09
Medical Treatment	20.27±3.76	21.0 [4.0]	21.03±2.84	21.0 [3.8]	Z=-1.25 p=0.28
Physical Exercise	10.96±2.98	12.0 [4.0]	10.33±3.16	11.0 [4.0]	Z=-1.42 p=0.16
DMSES–Total	73.21±13.18	73.5 [14.5]	74.11±11.96	73.0 [15.0]	t=-1.43 p=0.16

*Note: Independent Samples t-test (t) was used for normally distributed data, and Mann-Whitney U test (Z) was used for non-normally distributed data. DAAS: Diabetes Awareness and Acceptance Scale, DERS-16: Difficulties in Emotion Regulation Scale-Short Form, DMSES: Diabetes Management Self-Efficacy Scale, SD: Standard Deviation, IQR: Interquartile Range.

Note: The normality of the distribution of variables was evaluated using the Kolmogorov-Smirnov test. Since the data followed a normal distribution, Pearson correlation analysis was performed

The relationships between the DAAS, DERS-16, and DMSES scores are presented in Table 5. A statistically significant, weak positive correlation was identified between the total DAAS score and the total DMSES score. Furthermore, a statistically significant, very weak negative correlation was found between the total DAAS score and the total DERS-16 score ($p < 0.05$). Additionally, a statistically significant, very weak negative correlation was observed between the total DERS-16 score and the total DMSES score ($p < 0.001$).



Table 5. Correlation Matrix Between DAAS, DERS-16, and DMSES Total Scores

Correlation* (N=218)		DAAS			DERS-16					DMSES					
		Awareness	Acceptance	DAAS – Total	Clarity	Goals	Impulse	Strategies	Non-acceptance	DERS-16 Total	Diet+Foot Care	Medical Treatment	Physical Exercise	DMSES –Total	
DAAS	Awareness	<i>r</i>	1.0	0.32	0.83	-0.06	0.01	0.03	0.04	0.08	0.04	0.24	0.27	0.17	0.27
		<i>p</i>	-	<0.001	<0.001	0.36	0.87	0.68	0.58	0.25	0.52	<0.001	<0.001	0.01	<0.001
	Acceptance	<i>r</i>	0.32	1.00	0.76	-0.24	-0.38	-0.33	-0.40	-0.28	-0.39	0.42	0.24	0.29	0.42
		<i>p</i>	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
DAAS–Total	<i>r</i>	0.83	0.76	1.00	-0.19	-0.21	-0.17	-0.20	-0.11	-0.10	0.39	0.32	0.28	0.42	
	<i>p</i>	<0.001	<0.001	-	0.005	0.002	0.01	0.003	0.10	0.004	<0.001	<0.001	<0.001	<0.001	
DERS-16	Clarity	<i>r</i>	-0.06	-0.24	-0.19	1.00	0.54	0.49	0.54	0.47	0.69	-0.27	-0.07	-0.26	-0.27
		<i>p</i>	0.36	<0.001	0.005	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.29	<0.001	<0.001
	Goals	<i>r</i>	0.01	-0.38	-0.21	0.54	1.00	0.61	0.71	0.52	0.86	-0.19	0.01	-0.14	-0.18
		<i>p</i>	0.87	<0.001	0.02	<0.001	-	<0.001	<0.001	<0.001	<0.001	0.004	0.84	0.04	0.006
	Impulse	<i>r</i>	0.02	-0.33	-0.17	0.49	0.61	1.00	0.75	0.62	0.82	-0.18	-0.09	-0.14	-0.18
		<i>p</i>	0.68	<0.001	0.01	<0.001	<0.001	-	<0.001	<0.001	<0.001	0.007	0.21	0.03	0.007
	Strategies	<i>r</i>	0.04	-0.40	-0.20	0.54	0.71	0.75	1.00	0.70	0.92	-0.24	-0.08	-0.16	-0.22
		<i>p</i>	0.58	<0.001	0.003	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	0.27	0.02	<0.001
Non-acceptance	<i>r</i>	0.08	-0.28	-0.11	0.47	0.52	0.62	0.70	1.00	0.76	0.021	-0.04	-0.09	-0.19	
	<i>p</i>	0.25	<0.001	0.01	<0.001	<0.001	<0.001	<0.001	-	<0.001	0.002	0.54	0.178	0.004	
DERS-16 Total	<i>r</i>	0.04	-0.39	-0.20	0.689	0.86	0.82	0.92	0.76	1.00	-0.24	-0.06	-0.18	-0.23	
	<i>p</i>	0.52	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	0.40	0.007	<0.001	
DMSES	Diet+Foot Care	<i>r</i>	0.24	0.42	0.39	-0.27	-0.19	-0.18	-0.24	-0.21	-0.24	1.00	0.50	0.43	0.92
		<i>p</i>	<0.001	<0.001	<0.001	<0.001	0.004	0.007	<0.001	0.02	<0.001	-	<0.001	<0.001	<0.001
	Medical Treatment	<i>r</i>	0.27	0.24	0.32	-0.07	0.01	-0.09	-0.08	-0.04	-0.06	0.50	1.00	0.43	0.68
		<i>p</i>	<0.001	<0.001	<0.001	0.29	0.84	0.21	0.27	0.54	0.40	<0.001	-	<0.001	<0.001
	Physical Exercise	<i>r</i>	0.17	0.29	0.28	-0.28	-0.14	-0.14	-0.16	-0.09	-0.18	0.47	0.43	1.00	0.65
		<i>p</i>	0.01	<0.001	<0.001	<0.001	0.04	0.03	0.02	0.18	0.007	<0.001	<0.001	-	<0.001
	DMSES –Total	<i>r</i>	0.27	0.42	0.42	-0.27	-0.18	-0.18	-0.22	-0.19	-0.23	0.92	0.68	0.65	1.00
	<i>p</i>	<0.001	<0.001	<0.001	<0.001	0.006	0.007	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	-	

*Note: Spearman's correlation analysis was used. *r*: Correlation coefficient. DAAS: Diabetes Awareness and Acceptance Scale, DERS-16: Difficulties in Emotion Regulation Scale-Short Form, DMSES: Diabetes Management Self-Efficacy Scale. Note: The normality of the data was assessed using the Kolmogorov-Smirnov test. Since the data followed a normal distribution, Pearson Correlation Analysis was used. ** *p* < 0.01, * *p* < 0.05.



DISCUSSION

The primary way to cope with the disease is for the individual to accept their condition and practice self-management (25). It is observed that individuals who have become aware of their diabetes and have successfully achieved acceptance maintain their daily lives more easily, undergo a more successful treatment process, and cope more effectively with the physical and psychological challenges brought by the disease (26,27). One of the potential barriers to managing glycemic control in individuals with diabetes is the emotional distress associated with living with the condition (28). Due to the increasing prevalence of diabetes, effective monitoring of the disease is of critical importance. In this regard, the education received by the individual increases self-efficacy, positively develops health-belief levels, benefits the improvement of metabolic control, and supports the acquisition of positive health habits (29). This study was conducted to evaluate the levels of diabetes awareness, emotional state, and self-efficacy in individuals with Type 2 diabetes.

In a previous study, the awareness sub-dimension score of the Diabetes Awareness and Acceptance Scale (DAAS) was found to be 40.61 ± 15.14 for males and 47.21 ± 15.29 for females. It was reported that there was no statistically significant difference between the participants' gender and their DAAS awareness scores ($p > 0.05$) (30). In another study examining disease awareness in individuals with diabetes, the mean diabetes awareness score was 27.50 ± 5.70 , indicating that the individuals did not possess sufficient awareness (31). In the present study, the DAAS awareness sub-dimension score was found to be 55.83 ± 9.48 for males and 58.19 ± 9.82 for females (Table 3). A statistically significant difference was detected in awareness scores according to gender ($p = 0.05$). The awareness scores of females were found to be significantly higher than those of males. When interpreting the scores by converting them to a centesimal system (considering 115 points as representing full awareness and acceptance), it is observed that the diabetes awareness and acceptance levels of all individuals participating in this study were above 81%; above 79% for males, and above 82% for females.

In another study, it was stated that females experienced higher levels of difficulty in emotion regulation compared to males (32). Conversely, a study conducted by Sancho et al. (33) revealed that males exhibited greater emotion regulation difficulties than females. In a different study, no significant difference was found between the emotion regulation difficulty scores of males and females (34).



In the present study, the DERS-16 total score of females was found to be significantly higher than that of males ($p=0.01$) (Table 3). This situation indicates that the females participating in our study have less adequate skills in coping with emotions and lower emotion management compared to males. The self-report nature of the Difficulties in Emotion Regulation Scale-16 (DERS-16) may have caused females to evaluate their emotional experiences more openly and critically. Males, on the other hand, may tend to underreport their emotion regulation problems. While females are socially encouraged to recognize and express their emotions more, males can be directed to suppress or externalize their feelings. This dynamic may have led females to recognize and report their emotion regulation difficulties more prominently on self-report scales.

In a study conducted by Yılmaz et al. (35) individuals' HbA1c levels were compared with their disease acceptance levels, and it was found that individuals with an HbA1c level of $\leq 7.0\%$ had higher disease acceptance levels than those with an HbA1c level of $>9.0\%$ (35). The study concluded that there is a relationship between individuals' disease acceptance levels and glycemic control, where those with higher acceptance levels also achieved better glycemic control. In another study, it was stated that individuals with lower diabetes acceptance had higher HbA1c levels.⁹ Furthermore, a study conducted in Turkey found that individuals' disease awareness and acceptance status had a negative effect on HbA1c values. It was reported that as individuals' disease awareness and acceptance levels increased, their HbA1c values decreased (36).

In the present study, the DAAS awareness, acceptance, and total scores of individuals with HbA1c $\geq 7\%$ were found to be significantly higher than those with HbA1c $< 7\%$ ($p < 0.05$) (Table 4). Individuals with HbA1c $\geq 7\%$ generally encounter more frequent hyperglycemia, treatment adjustments, physician warnings, and clinical follow-ups. This situation may have contributed to these individuals thinking more about their disease, perceiving the place of diabetes in their lives more clearly, and strengthening their disease acceptance processes. Findings in the literature regarding the relationship between HbA1c levels and diabetes awareness and acceptance are not consistent. It is thought that these differences in the literature may stem from sample characteristics, disease duration, measurement tools used, and sociocultural factors.

In the present study, a statistically significant positive and weak correlation was found between the total DAAS score and the total DMSES score, while a statistically significant negative and very weak correlation was found between the total DAAS score and the total DERS-16 score



($p < 0.05$) (Table 5). This situation can be explained as follows: individuals with high levels of diabetes awareness and acceptance may acquire the skills to manage their health status more consciously and effectively. While this enables them to achieve positive outcomes in coping with diabetes, it may also increase their perceptions of self-efficacy. Simultaneously, it may contribute to better emotion regulation, control of negative emotional responses, and the development of stronger psychological resilience regarding living with diabetes by reducing stress levels.

Furthermore, a statistically significant negative and very weak correlation was detected between the total DERS-16 score and the total DMSES score ($p < 0.001$) (Table 5). Difficulties in emotion regulation may have weakened individuals' problem-solving and decision-making skills by making it harder for them to cope with stress. This situation may lead to a loss of self-confidence and avoidance of health management, thereby causing a decrease in the individual's perception of self-efficacy.

LIMITATIONS OF THE STUDY

There are several limitations to this study that should be considered when interpreting the results. First, the use of a non-probability convenience sampling method may limit the generalizability of the findings to the broader population of individuals with Type 2 Diabetes. Second, the cross-sectional design of the study prevents the establishment of definitive causal relationships between diabetes awareness, emotional state, and self-efficacy. Finally, potential confounding variables, such as age, BMI, education level, and duration of diabetes, were not controlled in multivariate statistical models. Although these variables were presented descriptively, their lack of inclusion in multivariate analyses remains a limitation. Future research employing longitudinal designs and multivariate analysis techniques is recommended to provide a more comprehensive understanding of these relationships.

CONCLUSIONS

In this study, the relationships between diabetes awareness, emotional state, and self-efficacy levels in individuals with Type 2 diabetes were comprehensively evaluated. It was observed that females had higher diabetes awareness levels than males, but they also experienced greater difficulties in emotion regulation. It was determined that as the level of diabetes awareness and acceptance increased, the self-efficacy levels of individuals increased, while their emotion regulation difficulties decreased. A significant relationship was found between HbA1c levels



and the level of awareness and acceptance; it was determined that individuals with higher awareness and acceptance levels had better glycemic control.

These findings demonstrate that psychological and behavioral factors are as important as biochemical parameters in diabetes management. It is suggested that multidisciplinary education programs aimed at increasing diabetes awareness, supporting disease acceptance, and strengthening self-efficacy will contribute to the improvement of glycemic control. The findings obtained support the view that diabetes is not only a biochemical disease but also a psychosocial process, indicating that future research should proceed by taking this multidimensional structure into account.

STATEMENT OF PUBLIC HEALTH SIGNIFICANCE

This study highlights the critical role of psychosocial factors in Type 2 diabetes management. Enhancing diabetes awareness and self-efficacy improves emotional well-being, contributing to the prevention of chronic complications and reduction in healthcare costs. These findings underscore the necessity of holistic, patient-centered approaches within public health strategies.

Abbreviations

ANOVA: One-Way Analysis of Variance

BIA: Bioelectrical Impedance Analysis

BMI: Body Mass Index

DAAS: Diabetes Awareness and Acceptance Scale

DERS-16: Difficulties in Emotion Regulation Scale-Short Form

DMSES: Self-Efficacy Scale for Type 2 Diabetics

HbA1c: Hemoglobin A1c

WHO: World Health Organization

IDF: International Diabetes Federation

TURDEP: Turkey Diabetes, Hypertension, Obesity, and Endocrinology Prevalence Study

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out in accordance with the Helsinki Declaration. All procedures in the study were conducted in accordance with the Declaration of Helsinki.

REFERENCES

1. Yalçın M, Yetkin İ. Guideline for diagnosis, treatment, and follow-up of diabetes mellitus and its complications. 2022.
2. Magliano DJ, Boyko EJ, Atlas ID. What is diabetes? In: IDF Diabetes Atlas. 10th ed. International Diabetes Federation; 2021.
3. Roglic G. WHO Global report on diabetes: A summary. *Int J Noncommun Dis.* 2016;1(1):3-8.
4. World Health Organization. IDF diabetes atlas 2025. Accessed December 30, 2025. <https://diabetesatlas.org/resources/idf-diabetes-atlas-2025/>
5. Satman I, Omer B, Tutuncu Y, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol.* 2013;28(2):169-80.
6. Dağdelen S, Balcı M, Deyneli O, et al. Diabetes diagnosis and treatment guideline. 2023.
7. DeFronzo RA, Eldor R, Abdul-Ghani M. Pathophysiologic approach to therapy in patients with newly diagnosed type 2 diabetes. *Diabetes Care.* 2013;36(suppl 2):S127-S139.
8. İlaslan E, Dalkıran Ş, Özer ZC, Balcı MK. The level of disease acceptance in individuals with type 2 diabetes and the caregiving burden of caregivers. *J Cont Med Educ (STED).* 2021;30(2):84-95.
9. Schmitt A, Reimer A, Kulzer B, et al. Assessment of diabetes acceptance can help identify patients with ineffective diabetes self-care and poor diabetes control. *Diabet Med.* 2014;31(11):1446-51.
10. Bintaş-Zörer P, Yorulmaz O. A current look at emotion regulation: Contextual factors. *Curr Approaches Psychiatry.* 2022;14(2):195-206.
11. Sturt J, Dennick K, Hessler D, et al. Effective interventions for reducing diabetes distress: Systematic review and meta-analysis. *Int Diabetes Nurs.* 2015;12(2):40-55.
12. Van Der Ven NC, Weinger K, Yi J, et al. The confidence in diabetes self-care scale: Psychometric properties of a new measure of diabetes-specific self-efficacy in Dutch and US patients with type 1 diabetes. *Diabetes Care.* 2003;26(3):713-18.
13. Akturk U, Aydinalp E. Examining the correlation between the acceptance of the disease and the diabetes self-efficacy of the diabetic patients in a family health center. 2018.



14. Aseela S, Santhi S, Anish T. Diabetes self-efficacy on glycemic control and well-being of patients with type 2 diabetes mellitus: An analytical cross-sectional study. *Cureus*. 2024;16(7):e64512.
15. Kyle UG, Bosaeus I, De Lorenzo AD, et al. Bioelectrical impedance analysis—part I: Review of principles and methods. *Clin Nutr*. 2004;23(5):1226-43.
16. World Health Organization. Body mass index. Accessed December 2, 2025. <https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---body-mass-index-bmi>
17. World Health Organization. Waist circumference and waist-hip ratio: Report of a WHO expert consultation, Geneva, 8–11 December 2008. 2011.
18. Atik D, Manav A, Keser E. A scale development study: Diabetes Awareness and Acceptance Scale. *Diabetes Stoffw Herz*. 2022;31(3):152-8.
19. Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *J Psychopathol Behav Assess*. 2004;26(1):41-54.
20. Bjureberg J, Ljótsson B, Tull MT, et al. Development and validation of a brief version of the difficulties in emotion regulation scale: the DERS-16. *J Psychopathol Behav Assess*. 2016;38(2):284-96.
21. Yiğit İ, Guzey Yiğit M. Psychometric properties of Turkish version of difficulties in emotion regulation scale-brief form (DERS-16). *Curr Psychol*. 2019;38(6):1503-1511.
22. Bijl JV, Poelgeest-Eeltink AV, Shortridge-Baggett L. The psychometric properties of the diabetes management self-efficacy scale for patients with type 2 diabetes mellitus. *J Adv Nurs*. 1999;30(2):352-9.
23. Yeşilbakan ÖU. Investigation of self-efficacy and factors affecting self-efficacy in self-care of type 2 diabetic patients [Master's thesis]. Ege University; 2001.
24. Kara M, Van Der Bijl JJ, Shortridge-Baggett LM, Astı T, Erguney S. Cross-cultural adaptation of the diabetes management self-efficacy scale for patients with type 2 diabetes mellitus: Scale development. *Int J Nurs Stud*. 2006;43(5):611-621.
25. Besen DB, Esen A. Adaptation of the Acceptance of Illness Scale to diabetic individuals in Turkish society. *TAF Prev Med Bull*. 2011;10(2):135-42.



26. Döner E, Çırpan R, Çürük GN. Determination of the relationship between attitudes towards disease and health and acceptance of disease in patients with diabetic foot. *Ege Univ Fac Nurs J.* 2023;39(1):81-91.
27. Şireci E, Karabulutlu EY. Determination of the levels of acceptance of illness and self-efficacy in self-care of patients with type 2 diabetes mellitus. *J Anatolia Nurs Health Sci.* 2017;20(1):48-55.
28. Coccaro EF, Drossos T, Kline D, et al. Diabetes distress, emotional regulation, HbA1c in people with diabetes and a controlled pilot study of an emotion-focused behavioral therapy intervention in adults with type 2 diabetes. *Prim Care Diabetes.* 2022;16(3):381-6.
29. Durak E, Yılmaz M. The relationship between nutritional literacy, self-efficacy and diabetes self-care activities in individuals diagnosed with Type 2 Diabetes Mellitus. *Hacettepe Univ Fac Nurs J.* 2022;9(3):311-8.
30. Karataş G, Özdemir Ç. Evaluation of happiness levels according to disease awareness and acceptance in patients with Type 2 Diabetes Mellitus. *Turk J Diab Obesity.* 2024;8(2):180-90.
31. Al-Khawaldeh OA, Al-Jaradeen N. Diabetes awareness and diabetes risk reduction behaviors among attendance of primary healthcare centers. *Diabetes Metab Syndr.* 2013;7(3):172-8.
32. Vitró-Alcaraz C, Munguía L, Granero R, et al. Emotion regulation as a transdiagnostic factor in eating disorders and gambling disorder: Treatment outcome implications. *J Behav Addict.* 2022;11(1):140-6.
33. Sancho M, De Gracia M, Granero R, et al. Differences in emotion regulation considering gender, age, and gambling preferences in a sample of gambling disorder patients. *Front Psychiatry.* 2019;10:625.
34. Yılmaz Y, Cenkseven F. Self-compassion as a predictor of emotion regulation difficulty in university students. *Cukurova Univ J Soc Sci Inst.* 2020;29(4):168-82.
35. Yılmaz FT, Şahin AD, Türesin AK. The relationship between the level of disease acceptance and glycemic control in individuals with type 2 diabetes. *Cukurova Med J.* 2019;44(4):1284-91.
36. Yavuz B. The effect of diabetes awareness and acceptance on the metabolic control status of patients [Master's thesis]. *Acıbadem Mehmet Ali Aydınlar University;* 2024.

