

## Association between Accepting the Illness and Effective Insulin Administration in Patients with Type 2 Diabetes Mellitus

Şengül KORKMAZ BINAY<sup>1\*</sup> and Türkinaz AŞTI<sup>2</sup>

<sup>1</sup>Erzincan Binali Yıldırım University, Faculty of Health Sciences, Nursing Department, MSc, RN, Başbağlar Mahallesi, 1404 Sok. No: 15/3 24030 Erzincan-Türkiye.

<sup>2</sup>Bezmi Alem University, Faculty of Health Sciences, Nursing Department, PhD, RN, Professor.

### \*Correspondence:

Şengül Korkmaz Binay, Erzincan Binali Yıldırım University, Faculty of Health Sciences, Nursing Department, MSc, RN, Başbağlar Mahallesi, 1404 Sok. No: 15/3 24030 Erzincan-Türkiye, Tel: +90 536 612 44 95, Fax: +90 446 226 58 62, ORCID: 0000-0002-1541-3188.

Received: 17 July 2021; Accepted: 29 August 2021

**Citation:** Korkmaz Binay S, Asti T. Association between Accepting the Illness and Effective Insulin Administration in Patients with Type 2 Diabetes Mellitus. Nur Primary Care. 2021; 5(4): 1-8.

### ABSTRACT

**Purpose:** Patients with type 2 diabetes will be easier to adapt to treatment if they accept their illness. To investigate the association between individual, disease-related and care-related properties of the individuals and their accepting the disease, and effective insulin administration.

**Material and Methods:** 103 diabetic patients were included in the study. The Acceptance of Illness Scale (AIS) and the Diabetes Fear of Injecting and Self-Testing Questionnaire (D-FISQ) were used for the data collection. The data were analyzed using the descriptive statistics.

**Results:** The Cronbach alpha was 0.96 for AIS, 0.95 for fear of self-injecting (FSI), 0.80 for fear of self-testing (FST) and 0.85 for total D-FISQ. A negative association was determined between the AIS score, and FSI, FST, total D-FISQ; a positive association was found between the FSI score and FST, total D-FISQ scores and between FST and the total D-FISQ scores. The FSI score was found to be higher among females.

**Conclusion:** Accepting the disease affects an effective insulin administration behavior. Hence, nursing care and education of the individuals should be planned and implemented so as to improve the acceptance level of diabetes.

### Keywords

Acceptance of illness score, Effective insulin administration, Fear of insulin injection, Fear of testing, Type 2 diabetes.

### Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder resulting from insufficient release of the insulin hormone and/or reduced response to insulin in the peripheral tissues due to beta cell dysfunction in the pancreas and it requires constant medical care. Diabetes mellitus is classified in four etiologic groups as type 1, type 2, gestation diabetes and other specific types [1-3].

While dietary regulations, exercise, and having and maintaining

an ideal weight may be sufficient for controlling type 2 diabetes, oral anti-diabetic (OAD) medications and/or insulin may also be required [3].

Diabetes is a disorder that requires having information about the plasma glucose control, alterations in dietary habits, type and number of meals to be skipped, necessity of constant OAD use or insulin injection and lifestyle modifications due to exercise [3,4].

The patients should follow the rules of diabetes treatment and this condition may lead to emergence of adaptation and acceptance problems, because the patient should execute the rules of diabetes treatment including physical activity, OAD and insulin

use, and make changes in daily routines. In this context, proper interventions should be carried out in order to facilitate accepting and adapting the disease for maintenance of daily living without impairing the quality of life. The most challenging problems in type 2 DM treatment were reported to be related to the diet and insulin injection in a limited number of studies investigating the experiences about accepting and adapting the disease [5].

Regular control of the basic knowledge and skills of the patients and the families by the nurses and evaluating the patients with a holistic approach through using their roles in education and consultation enable timely detection of the potential problems, because worries about the future, about being insufficient in life and fear of being dependent on others, worries about body image in addition to emotional reactions and adaptation difficulties due to complication and treatments affect the physical, cognitive and emotional functions and the social life of the individuals [6].

In this context, in order to enable the patients to gain skills for controlling and managing their illness, it is necessary to determine the relationship between accepting the illness and effective insulin use beside providing proper individual care and constant education, sufficient information about plasma glucose control and insulin use.

In this study, we aimed to investigate the relationship between accepting the disease and effective insulin administration in individuals with Type 2 diabetes.

## Materials and Methods

This paper was a descriptive, study design to investigate the association between individual, disease-related and care-related properties of the individuals and their accepting the disease, and effective insulin administration.

### Study Universe and Study Sample

The study universe was composed of the patients who had been admitted to the Endocrinology, Diabetes and Obesity, Internal Medicine I-II and Nephrology outpatient and inpatient clinics of the Internal Medicine Department of Istanbul University, Cerrahpasa Faculty of Medicine, and the study sample was composed of individuals who had been admitted to the Internal Medicine Department of Istanbul University Cerrahpasa Faculty of Medicine between 2012-2013 and who fulfilled the inclusion criteria. The patients were included in the study in order of admission. As a result of the power analysis, it was found that the study could be conducted with 0.95 power and 0.95 confidence if conducted with 96 subjects, and with 0.80 power and 0.95 confidence if conducted with 60 subjects. Four substitutes were planned to be added to the initial sample estimation considering the case or data loss due to any reason; hence, the study was conducted with 103 diabetic subjects.

Inclusion criteria were as follows:

- ✓ Volunteering for participation,

- ✓ Having been diagnosed with Type 2 DM,
- ✓ Not having psychiatric problems,
- ✓ Willingness for collaboration and communication,
- ✓ Using insulin.

Exclusion criteria were as follows:

- ✓ Not volunteering to participate,
- ✓ Being diagnosed with Type 1 DM,
- ✓ Having a psychiatric illness,
- ✓ Being closed to cooperation and communication,
- ✓ Using only oral anti-diabetic drugs.

### Data Collection Tools

The data were collected using the Turkish version of “Acceptance of Illness Scale” (AIS) and “Diabetes Fear of Injecting and Self-Testing Questionnaire” (D-FISQ) and “Patient Information Form”. The questionnaires were administered by the same researcher.

**Patient Information Form**, which includes questions about individual characteristics, knowledge level about diabetes care and insulin use, was developed by the researcher.

**Acceptance of Illness Scale (AIS)** was developed by Felton and Revenson in USA in 1984 based on the Sickness Impact Scale of Linkowski. The Turkish validity and reliability study of the scale was conducted by Büyükkaya Besen [7] and then published by Büyükkaya Besen and Esen [8]. The scale is used for evaluating the acceptance level of the disease. All dimensions of the scale contain special disease-related difficulties and limitations. The scale evaluates the limitations including disease-related self-competency insufficiency, the feeling of dependence on others and reduced self-esteem, negative feelings, deservingness and accepting feelings despite those feelings. The scale contains 8 items, each of which is 5 points. While 8 is the possible minimum score, 40 is the maximum, and this is the general measurement of acceptance level of the disease. The 5-Likert type scale is scored according to the state of agreeing with the expressions described. One is the minimum score that reflects not agreeing with the expressions and means insufficient acceptance, poor adaptation and severe physical disturbance. Agreeing with the expressions described is scored as 5 (the highest score), which is evidence of accepting the disease and reflects little negative emotions and reactions [7]. While the Cronbach alpha value of the scale was 0.79 in the study of Büyükkaya Besen [7], it was found to be 0.96 in this research.

**Diabetes Fear of Injecting and Self-Testing Questionnaire (D-FISQ)** was developed by Snoek et al. with the aim of investigating the fear of self-injecting and self-testing [9]. The Turkish reliability and validity study of the scale was conducted by Çelik [10] and then published by Çelik and Pınar [11]. D-FISQ, which includes 15 statements is composed of two sub-dimensions including the fear of self-injecting (6 statements) and fear of self-testing (9 statements). Each statement has 4-Likert type scored from 0 to 3 (0=almost never, 1= sometimes, 2= frequently, 3=almost always). The questionnaire form may be evaluated with mean or raw scores for both sub-dimensions and the whole form. Snoek

et al. who developed the response options recommend taking the mean values when most of the responses are 0. When raw scores are obtained, the score of fear of self-injecting may vary between 0 and 18, that of fear of self-testing varies between 0 and 27, and the Total D-FISQ score varies between 0 and 45. Higher scores indicate more fear. As the number of the cases who responded as “0” was high in the present study, and the score estimation of the sub- and main dimensions was made as mean first; the responses were re-coded as 1= almost never, 2= sometimes, 3= frequently, 4= almost always, and the mean values were estimated based on this in accordance with the recommendations of the statistical specialist [10]. While the Cronbach alpha value was 0.96 for Total D-FISQ, 0.93 for FSI and 0.95 for FST in the study of Çelik [10], they were found to be 0.95 for FSI, 0.80 for FST and 0.85 for total D-FISQ.

### Statistical Analysis

The NCSS (Number Cruncher Statistical System) 2007 & the PASS (Power Analysis and Sample Size) 2008 Statistical Software (Utah, USA) programs were used for the statistical analyses. Apart from the descriptive statistical methods (mean, standard deviation, median, frequency, ratio, minimum, maximum), the Mann Whitney U test was used for two-group comparisons of the quantitative data and the Kruskal Wallis test was used for comparison of three or more groups; the Mann Whitney U test was used for detection of the group that led to the difference. The Spearman correlation analysis was used for assessment of the associations between the parameters. Significance was set at  $p < 0.01$  and  $p < 0.05$ .

### Ethical Considerations

The department of Internal Medicine of Istanbul University Cerrahpasa Faculty of Medicine was applied to for the data collection and written consent was obtained. The ethics committee approval was obtained from the Clinical Researches Ethics Committee of Istanbul University Cerrahpasa Faculty of Medicine (date: 06 March 2012, approval number: A-12). Permissions were obtained from Besen and Çelik for using the scales. The participants were informed about the objective and the benefits of the study, their roles in the study, and verbal and written informed consent was obtained from the volunteers.

### Results

When the groups were analyzed, 56.3% ( $n=58$ ) were found to be female and 44.6% ( $n=46$ ) were found to be 62 years and above. The age of the participants varied between 33 and 86 with a mean age of 59.49 ( $SD=11.27$ ) years. Of the cases, 54.4% ( $n=56$ ) were seen to be obese with a mean body mass index (BMI) of 31.59 ( $SD=7.68$ ) kg/m<sup>2</sup> (range 16.9- 56.6 kg/m<sup>2</sup>).

The duration of diabetes varied between 1 and 49 years (mean  $13.00 \pm 9.37$ ). The duration of diabetes was between 2 and 10 in 44.7% ( $n=46$ ) of the cases, 58.3% ( $n=60$ ) of the cases were found to sometimes measure the plasma glucose before insulin injection, and 74.8% ( $n=77$ ) of the cases were found to measure the plasma glucose regularly.

When the subjects were analyzed with regard to insulin use, 52.4% ( $n=54$ ) were found to administer insulin once-twice daily, 94.2% ( $n=97$ ) were found to be able to apply self-injection, 70.9% ( $n=73$ ) were found not to have received help when administering insulin and 90.3% were found to have received education about insulin injection.

The scores of AIS were found to vary between 1.5 and 5 (mean  $3.51 \pm 0.77$ ; median 3.5). The scores of FSI were found to vary between 1 and 4 ( $1.33 \pm 0.78$ ; median 1). The scores of FST were found to vary between 1 and 4 (mean  $1.31 \pm 0.73$ ; median 1). The scores of Total D-FISQ were found to vary between 1 and 4 (mean  $1.32 \pm 0.65$ ; median 1) (Table 1).

A negative statistically significant correlation was found between AIS and FSI ( $r = -.326$ ;  $p \leq .001$ ) and FST ( $r = -.273$ ;  $p \leq .01$ ), and Total D-FISQ ( $r = -.365$ ;  $p \leq .001$ ) (Table 2). The scores of FSI, FST and the Total D-FISQ scores were found to decrease as the AIS score increased.

A positive statistically significant correlation was found between the FSI score and FST ( $r = .352$ ;  $p \leq .001$ ) and Total D-FISQ score ( $r = .755$ ;  $p \leq .001$ ). The scores of FST and Total D-FISQ were found to increase as the FSI score increased (Table 2).

A positive statistically significant correlation was found between the FST score and Total D-FISQ score ( $r = .802$ ;  $p \leq .001$ ). The Total D-FISQ score was seen to increase as the FST score increased (Table 2).

**Table 1:** Distribution of AIS, FSI, FST and Total D-FISQ scores of the subjects with type 2 DM.

Scale	Subjects with type 2 DM		
	Min-Max	Mean $\pm$ SD	Median
AIS	1.5-5.0	3.51 $\pm$ .77	3.5
FSI	1.0-4.0	1.33 $\pm$ .78	1.0
FST	1.0-4.0	1.31 $\pm$ .73	1.0
Total D-FISQ	1.0-4.0	1.32 $\pm$ .65	1.0

AIS: Acceptance of Illness Scale, FSI: Fear of Self-Injecting, FST: Fear of Self-Testing, Total D-FISQ: Diabetes Fear of Injecting and Self-Testing Questionnaire

**Table 2:** Distribution of the correlation scores of AIS, FSI, FST and total D-FISQ of the subjects with type 2 DM.

Scale Score		FSI Score	FST Score	Total D-FISQ Score
AIS Score	R	-.326	-.273	-.365
	p	.001**	.005**	.001**
FSI Score	R	-	.352	.755
	p	-	.001**	.001**
FST Score	R	-	-	.802
	p	-	-	.001**

r: Spearman's Correlation coefficient

\*\* $p < .01$

AIS: Acceptance of Illness Scale, FSI: Fear of Self-Injecting, FST: Fear of Self-Testing, Total D-FISQ: Diabetes Fear of Injecting and Self-Testing Questionnaire

While no significant difference was determined between AIS, FST and the Total D-FISQ scores with regard to age, a statistically significant difference was found between the FSI scores ( $p<.01$ ). The FSI scores of females were found to be significantly higher than those of males (Table 3).

No statistically significant difference was determined between the AIS, FSI, FST and Total D-FISQ scores with regard to duration of diabetes ( $p>.05$ ; Table 4).

A statistically significant difference was determined between the AIS scores of the cases with regard to testing plasma glucose before insulin injection ( $p<.05$ ). According to the paired comparisons made for detection of the group that caused the difference, the AIS scores of the patients who were not carrying out regular plasma glucose testing were found to be significantly higher than those of who were testing sometimes and regularly (Yes and No  $p=.016$ ; Sometimes and No  $p=.016$ ).

No statistically significant difference was found between the FSI and FST scores and Total D-FISQ scores with regard to the status of plasma glucose testing before insulin injection ( $p>.05$ ; Table 4).

No significant difference was found between the AIS, FSI, FST and Total D-FISQ scores with regard to the daily insulin injection frequency ( $p>.05$ ; Table 5).

While no significant difference was found between the AIS, FST and Total D-FISQ scores with regard to being able to do self-injecting ( $p>.05$ ), a significant difference was determined between the FSI scores ( $p<.01$ ). The fear scores of the subjects who could not do self-injecting were found to be significantly higher than those who could (Table 5).

## Discussion

It is known that significant lifestyle changes are required for achieving metabolic control of diabetes, accepting diabetes, following-up the plasma glucose and regular insulin injection. The most effective method for prevention and delay of diabetes complications has been emphasized to be plasma glucose level monitoring. The process of adapting exercise and nutritional changes for plasma glucose regulation has been reported to negatively influence the quality of life of the individuals [3,12]; hence, accepting the illness enables improvement of the quality of life of the patients through improving the adaptation to treatment [13]. In the present study that investigated the acceptance of the illness, fear of self-injecting and puncturing the fingertip, a negative statistically significant relationship was found between the AIS score, FSI score ( $r=-.326$ ;  $p\leq .001$ ), FST score ( $r=-.273$ ;  $p\leq .01$ ) and the Total D-FISQ score ( $r=-.365$ ;  $p\leq .001$ ) (Table 4-5). This result means that FSI, FST and Total D-FISQ scores decrease as the AIS score increases.

**Table 3:** Distribution of AIS, FSI, FST and Total D-FISQ scores according to individual characteristics of the diabetic subjects (N=103).

Individual Characteristics		AIS	Mean $\pm$ SD FSI	Median FST	Total D-FISQ
<b>Gender</b>					
Female (n=58)		3.50 $\pm$ .79 3.50	1.49 $\pm$ .92 1.00	1.34 $\pm$ .76 1.00	1.40 $\pm$ .72 1.00
Male (n=45)		3.52 $\pm$ .76 3.50	1.12 $\pm$ .48 1.00	1.27 $\pm$ .70 1.00	1.21 $\pm$ .56 1.00
<b>Test&amp;p</b>		Z: -.050; p: .960	Z: -2.649; p: .008**	Z: -.240; p: .810	Z: -1.580; p: .114
Age (year)	R	.044	-.078	.148	.026
	P	.658	.432	.136	.791
<b>Age group (year)</b>					
30-45 (n=12)		3.32 $\pm$ .52 3.35	1.52 $\pm$ .86 1.00	1.38 $\pm$ .87 1.00	1.44 $\pm$ .63 1.15
46-61 (n=45)		3.58 $\pm$ .68 3.60	1.32 $\pm$ .75 1.00	1.20 $\pm$ .63 1.00	1.25 $\pm$ .56 1.00
$\geq 62$ (n=46)		3.49 $\pm$ .90 3.50	1.30 $\pm$ .80 1.00	1.39 $\pm$ .79 1.00	1.36 $\pm$ .75 1.00
<b>Test&amp;p</b>		$\chi^2$ : 1.741; p: .419	$\chi^2$ : 2.252; p: .324	$\chi^2$ : 3.442; p: .179	$\chi^2$ : 2.529; p: .282
BMI (kg/m <sup>2</sup> )	R	-.054	.092	.064	.110
	P	.591	.355	.518	.268
<b>Body mass index*</b>					
Normal weight (n=20)		3.47 $\pm$ .59 3.50	1.19 $\pm$ .67 1.00	1.12 $\pm$ .40 1.00	1.14 $\pm$ .37 1.00
Overweight (n=27)		3.73 $\pm$ .84 4.00	1.24 $\pm$ .63 1.00	1.23 $\pm$ .67 1.00	1.24 $\pm$ .62 1.00
Obese (n=56)		3.41 $\pm$ .79 3.50	1.43 $\pm$ .88 1.00	1.41 $\pm$ .84 1.00	1.42 $\pm$ .74 1.00
<b>Test&amp;p</b>		$\chi^2$ : 3.353; p: .187	$\chi^2$ : 1.498; p: .473	$\chi^2$ : 4.592; p: .101	$\chi^2$ : 5.313; p: .070

AIS: Acceptance of Illness Scale, FSI: Fear of Self-Injecting, FST: Fear of Self-Testing, Total D-FISQ: Diabetes Fear of Injecting and Self-Testing Questionnaire

\*Normal weight: 18.50 kg/m<sup>2</sup> – 24.99 kg/m<sup>2</sup>, Overweight: 25.00 kg/m<sup>2</sup> – 29.99 kg/m<sup>2</sup>, Obese:  $\geq 30.00$  kg/m<sup>2</sup> (Turkey Ministry of Health, 2012)



**Table 4:** Distribution of AIS, FSI, FST and Total D-FISQ scores according to diabetes and care-related characteristics of the diabetic subjects (N=103).

Diabetes And Care-Related Characteristics	AIS	Mean $\pm$ SD FSI	Median FST	Total D-FISQ
<b>Duration of diabetes</b>				
$\leq 1$ year ( $n=9$ )	3.77 $\pm$ .723.40	1.56 $\pm$ .981.00	1.28 $\pm$ .601.00	1.39 $\pm$ .521.00
2 -10 years ( $n=46$ )	3.45 $\pm$ .72 3.50	1.43 $\pm$ .90 1.00	1.33 $\pm$ .82 1.00	1.38 $\pm$ .77 1.00
11-19 years ( $n=24$ )	3.55 $\pm$ .83 3.70	1.20 $\pm$ .57 1.00	1.08 $\pm$ .23 1.00	1.13 $\pm$ .30 1.00
20-28 years ( $n=17$ )	3.64 $\pm$ .76 3.50	1.04 $\pm$ .17 1.00	1.22 $\pm$ .44 1.00	1.16 $\pm$ .28 1.00
$\geq 29$ years ( $n=7$ )	3.14 $\pm$ 1.07 2.40	1.53 $\pm$ 1.12 1.00	2.17 $\pm$ 1.31 1.60	1.90 $\pm$ 1.13 1.30
<b>Test &amp; p</b>	$\kappa^2$ :1.873; $p$ : .599	$\kappa^2$ :5.864; $p$ : .118	$\kappa^2$ :1.875; $p$ :.599	$\kappa^2$ :5.158; $p$ :.161
<b>Status of testing plasma glucose*</b>				
<b>Yes</b> ( $n=37$ )	3.49 $\pm$ .74 3.50	1.29 $\pm$ .66 1.00	1.22 $\pm$ .62 1.00	1.25 $\pm$ .48 1.00
<b>No</b> ( $n=6$ )	4.27 $\pm$ .50 4.30	1.50 $\pm$ 1.22 1.00	1.53 $\pm$ 1.21 1.00	1.52 $\pm$ 1.22 1.00
<b>Sometimes</b> ( $n=60$ )	3.45 $\pm$ .79 3.50	1.34 $\pm$ .81 1.00	1.34 $\pm$ .75 1.00	1.34 $\pm$ .69 1.00
<b>Test &amp; p</b>	$\kappa^2$ :6.227; $p$ :.044*	$\kappa^2$ :.139; $p$ : .933	$\kappa^2$ :1.521; $p$ : .467	$\kappa^2$ : .924; $p$ : .630
<b>Frequency of testing plasma glucose</b>				
<b>Regularly</b> ( $n=77$ )	3.56 $\pm$ .72 3.50	1.30 $\pm$ .71 1.00	1.26 $\pm$ .66 1.00	1.28 $\pm$ .54 1.00
<b>Irregularly</b> ( $n=26$ )	3.36 $\pm$ .91 3.30	1.42 $\pm$ .97 1.00	1.44 $\pm$ .91 1.00	1.43 $\pm$ .92 1.00
<b>Test &amp; p</b>	Z: -.492; $p$ : .623	Z:-.899; $p$ : .369	Z: -.296; $p$ : .767	Z:-1.176; $p$ : .240

AIS: Acceptance of Illness Scale, FSI: Fear of Self-Injecting, FST: Fear of Self-Testing, Total D-FISQ: Diabetes Fear of Injecting and Self-Testing Questionnaire

\*Before insulin injecting

**Table 5:** Distribution of AIS, FSI, FST and Total D-FISQ scores according to insulin injection characteristics of the subjects with Type 2 DM (N=103).

Insulin Injection Characteristics		AIS	FSI	FST	Total D-FISQ
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD
<b>Daily insulin injection</b>					
<b>1-2 times</b> ( $n=54$ )	Mean $\pm$ SD	3.69 $\pm$ .67	1.32 $\pm$ .78	1.21 $\pm$ .54	1.26 $\pm$ .53
	Median	3.55	1.00	1.00	1.00
<b>3-4 times</b> ( $n=43$ )	Mean $\pm$ SD	3.33 $\pm$ .83	1.37 $\pm$ .83	1.45 $\pm$ .94	1.42 $\pm$ .81
	Median	3.40	1.00	1.00	1.00
$\geq 5$ times ( $n=6$ )	Mean $\pm$ SD	3.20 $\pm$ .92	1.17 $\pm$ .41	1.17 $\pm$ .41	1.17 $\pm$ .41
	Median	3.30	1.00	1.00	1.00
		$\kappa^2$ :4.678; $p$ :0.096	$\kappa^2$ :0.320; $p$ :.852	$\kappa^2$ :0.942; $p$ :.624	$\kappa^2$ :1.161; $p$ :.560
<b>Self-injection</b>					
<b>He/she can do</b> ( $n=97$ )	Mean $\pm$ SD	3.55 $\pm$ .74	1.27 $\pm$ .70	1.30 $\pm$ .72	1.29 $\pm$ .63
	Median	3.50	1.00	1.00	1.00
<b>He/she can't do</b> ( $n=6$ )	Mean $\pm$ SD	2.90 $\pm$ 1.13	2.37 $\pm$ 1.31	1.38 $\pm$ .94	1.78 $\pm$ .98
	Median	2.75	2.35	1.00	1.55
		Z:-1.461; $p$ :.144	Z:-2.842; $p$ :.004**	Z:-.509; $p$ :0.611	Z:-1.705; $p$ :.088
<b>Receiving help for insulin injection</b>					
<b>Yes</b> ( $n=30$ )	Mean $\pm$ SD	3.25 $\pm$ .93	1.67 $\pm$ 1.11	1.51 $\pm$ 1.00	1.58 $\pm$ .99
	Median	3.15	1.00	1.00	1.05
<b>No</b> ( $n=73$ )	Mean $\pm$ SD	3.61 $\pm$ .68	1.19 $\pm$ .55	1.22 $\pm$ .57	1.21 $\pm$ .42
	Median	3.50	1.00	1.00	1.00
		Z:-1.823; $p$ :.068	Z:-2.323; $p$ :.020*	Z:-1.226; $p$ :.220	Z:-1.672; $p$ :.095
<b>Education about insulin injection</b>					
<b>Yes</b> ( $n=93$ )	Mean $\pm$ SD	3.47 $\pm$ .73	1.32 $\pm$ .76	1.31 $\pm$ .74	1.32 $\pm$ .64
	Median	3.50	1.00	1.00	1.00
<b>No</b> ( $n=10$ )	Mean $\pm$ SD	3.83 $\pm$ 1.07	1.40 $\pm$ 0.97	1.29 $\pm$ 0.71	1.34 $\pm$ .81
	Median	4.05	1.00	1.00	1.00
		Z:-1.513; $p$ :.130	Z:-.113; $p$ :.910	Z:-.5830; $p$ :.560	Z:-.069; $p$ :0.945

AIS: Acceptance of Illness Scale, FSI: Fear of Self-Injecting, FST: Fear of Self-Testing, Total D-FISQ: Diabetes Fear of Injecting and Self-Testing Questionnaire

In the study of Polonsky et al. [14], 28.2% of the patients for whom initiation of insulin injection had been decided, were reported not to accept injecting and it was reported that 50.8% did not wish to do injections as they found it a painful procedure. In the study of Ockleford et al. [15], most of the diabetic patients were reported to accept the disease. Jaworski et al. [16] revealed a positive correlation between regular plasma glucose monitoring and accepting the disease. A positive correlation was detected between accepting the disease and the quality of life in the study of Bien et al. [17]. In this context, accepting the disease expresses better adaptation to lifestyle changes and insulin administration. The result of FSI score decreasing as the AIS score increases that was determined in the present study is consistent with other studies.

Effective insulin administration and regular plasma glucose monitoring has an important place in diabetes management [18-21]. In the study of Ong et al. [22], diabetic individuals did not measure the plasma glucose due to fear and pain during the procedure. In addition, in the study of Aleali et al. [23] investigating the psychological causes of insulin fear in subjects with Type 2 DM, they were found to be resistant to insulin treatment due to feeling fear during injection. That study also revealed that this fear could be overcome through education. Jha et al. [24] also obtained similar results. This shows that fear negatively influences the plasma glucose monitoring. Besides, fear may lead to problems in starting insulin, continuation of insulin administration and self-monitoring [19,20]. The literature data support this finding.

Diabetic individuals should gain the skills of plasma glucose measurement and recording, and they should be ready to behave in accordance with the measurement results [2,25]. The patients' thinking that insulin leads to weight gain besides the factors that challenge insulin administration like fear of injecting and feeling pain during injection, causes resistance to starting insulin [19]. These results reveal the importance of accepting diabetes for being ready to behave properly.

A positive statistically significant relationship was determined between the FSI score and FST ( $r = .352$ ;  $p \leq .001$ ) and the Total D-FISQ score ( $r = .755$ ;  $p \leq .001$ ). This result means that the FST and Total D-FISQ scores increase as the FSI score increases, and also indicates the consistency between the data about fear in diabetes management.

The patients' not accepting diabetes has been reported to lead to worries like negatively approach to insulin use and failing in injection with a correct technique [26,27]. These worries also impair the self-injecting and plasma glucose measurement. In the study of Nakar et al. [20], 3% of the diabetic subjects suggested that they would feel pain due to puncturing the fingertip and 24% due to insulin injection. The authors reported that the diabetic subjects did not want insulin injection despite being aware of its importance. In the study of Bayrak and Dedeli Çaydam [28] investigating the fear of insulin injection and puncturing fingertip, and metabolic variables, diabetic individuals were reported to experience the fear of insulin injection and puncturing the fingertip. Besides, severe

fear of insulin injection and puncturing the fingertip was reported to be associated with elevated plasma glucose and diastolic blood pressure values. These data explain the linear positive association between fear of self-injecting and plasma glucose measurement.

The fear of insulin injection and puncturing for glucose measurement leads to a problem in starting diabetes treatment [29-33]. In the study of Rubin et al. [34] investigating the problems in insulin treatment, 20% of the patients were found to experience anxiety due to injection, 37% were found to have injection-related pain. In the study of Khan et al. [35], 83.7% of diabetic patients were found to be reluctant to insulin injection. The literature data show that the most important non-compliance is associated with diet and insulin injection [5]. The reluctance of diabetic subjects to insulin injection supports the data that fear increases during the insulin injection. Therefore, it is of great importance that diabetes nurses evaluate the patients with regard to insulin administration, puncturing the fingertip, injection and testing fear.

A positive statistically significant association was determined between the FSI score and the Total D-FISQ score ( $r = .802$ ;  $p \leq .001$ ). This result indicates that the Total D-FISQ score increases as the FST increases. Self-monitoring of plasma glucose has an important place in the care of patients with Type 2 diabetes, because it provides real-time feed-back [36]. This provides information about the plasma glucose level of diabetic patients and enables determination of the insulin dose. However, the result that the Total Diabetes Fear of Injecting and Self-Testing Questionnaire score increases as the fear of self-testing increases suggests that diabetes would negatively influence the control of the diabetic patients' lives. Hence, fear of plasma glucose measurement should be diagnosed in detail and the patients should be educated for the interventions for reducing pain.

The fear of self-testing scores of females was higher than those of males, the AIS scores of the patients who were not testing glucose before insulin injection were higher than those who measured sometimes and regularly, the fear scores of the patients who could not do self-injection were higher than those who could, and the FST scores of the patients who had received help for injection were higher than those who had not received help. Ghanbari et al. [37] reported that male subjects were affected to a lower extent by diabetes than females. This result indicates that male patients adapt better than females. The non-testing of the plasma glucose by diabetic patients, which is necessary for diabetes management and care, indicates that they do not accept the disease, and that they are not aware of the importance of glycemic control and the complications of diabetes, because home testing of glucose is a part of the treatment and it has been seen to improve the success of treatment [3]. Plasma glucose monitoring has led to huge differences in the management of diabetes [38]. Adaptation to diabetes and individual follow-up has been suggested to be more difficult among the patients who cannot do self-injecting compared to those who can. In addition, the hypothesis that "The individuals do not want self-injecting" may be proposed. In the study of Aslan and Korkmaz [39], 59.1% of diabetic patients were found to forget

insulin administration, 31.8% were found to skip the injections and 56,4% were determined not to make a rotation of injection sites. As a result of this study, education was found to be important for eliminating the errors concerning the management of diabetes and insulin administration in diabetic patients.

There are some limitations of our study. These are that the sampling method was not probabilistic and the research was conducted in a single institution.

As a conclusion, it is necessary to provide education about the disease process for improving the acceptance of the disease and reducing the testing and injection-related fear, and treatment and care should be planned individually for increasing the acceptance level of the disease and thereby reducing the fear of testing and injecting. Because of this, nurses should control patients' self-management and give education regularly.

### Main Points

- Accepting the disease affects an effective insulin administration behavior.
- Nursing care and education of the individuals should be planned and implemented so as to improve the acceptance level of diabetes.

### Acknowledgment

Thank you very much to Prof. Dr. Nurten Kaya and Dr. Ebru Yıldız for their important contributions.

### References

1. American Diabetes Association. Introduction standards of medical care in diabetes 2020. *Diabetes Care*. 2020a; 43: S1-S2.
2. <https://idf.org/aboutdiabetes/what-is-diabetes.html>
3. TEMD. Complications of Diabetes Mellitus and Diagnosis Treatment and Monitoring Guide Turkey Endocrinology and Metabolism Society. 2019.
4. American Diabetes Association. Improving Care and Promoting Health in Populations Standards of Medical Care in Diabetes 2020. *Diabetes Care*. 2020b; 43: S7-S13.
5. Demirtaş A, Akbayrak N. Determination of adaptation and acceptance criteria of patients with Type 2 diabetes mellitus. *Anatol J Clin Investig*. 2009; 3: 10-18.
6. Bahar A. Determination of anxiety and depression levels of patients with diabetes mellitus. *Firat Health Services Journal*. 2006; 1: 3-16.
7. Büyükkaya, Besen D. Application of the Disease Acceptance Scale to Diabetic Individuals in the Turkish Society and Determination of Affecting Factors T.C. Ege University Institute of Health Sciences PhD Thesis İzmir. 2009.
8. Besen DB, Esen A. Acceptance of illness and related factors in Turkish patients with diabetes. *Social Behavior and Personality an international journal*. 2012; 40: 1597-1609.
9. Snoek FJ, Mollema ED, Heine RJ, et al. Development and validation of the diabetes fear of injecting and self-testing questionnaire D-FISQ first findings. *Diabetic medicine*. 1997; 14: 871-876.
10. Çelik S. Psychometric valuation of a Turkish version of the diabetes fear of self-injecting and self-testing questionnaire D-FISQ. T.C. Marmara University Institute of Health Sciences. PhD Thesis İstanbul. 2010.
11. Celik S, Pinar R. Psychometric valuation of a Turkish version of the diabetes fear of self-injecting and self-testing questionnaire D-FISQ. *Asian nursing research*. 2016; 10: 195-200.
12. Bąk E, Nowak-Kapusta Z, Dobrzym-Matusiak D, et al. An assessment of diabetes-dependent quality of life ADDQoL in women and men in Poland with type 1 and type 2 diabetes. *Annals of agricultural and environmental medicine AAEM*. 2019; 26: 429.
13. Rogon I, Kasprzak Z, Szcześniak Ł. Perceived quality of life and acceptance of illness in people with type 2 diabetes mellitus. *Przegląd men opauzalny= Menopause review*. 2017; 16: 79.
14. Polonsky WH, Fisher L, Guzman S, et al. Psychological insulin resistance in patients with type 2 diabetes the scope of the problem. *Diabetes care*. 2005; 28: 2543-2545.
15. Ockleford E, Shaw RL, Willars J, et al. Education and self-management for people newly diagnosed with type 2 diabetes a qualitative study of patients' views. *Chronic Illness*. 2008; 4: 28-37.
16. Jaworski M, Panczyk M, Cedro M, et al. Adherence to dietary recommendations in diabetes mellitus disease acceptance as a potential mediator. *Patient preference and adherence*. 2018; 12: 163.
17. Bień A, Rzońca E, Kańczugowska A, et al. Factors affecting the quality of life and the illness acceptance of pregnant women with diabetes. *International journal of environmental research and public health*. 2016; 13: 68.
18. Mathew TK, Tadi P. Blood Glucose Monitoring. Updated 2020 Aug 14. In StatPearls Internet. Treasure Island FL StatPearls Publishing. 2020.
19. Meece J. Dispelling myths and removing barriers about insulin in type 2 diabetes. *The Diabetes Educator*. 2006; 32: 9S-18S.
20. Nakar S, Yitzhaki G, Rosenberg R, et al. Transition to insulin in Type 2 diabetes family physicians' misconception of patients' fears contributes to existing barriers. *Journal of Diabetes and its Complications*. 2007; 21: 220-226.
21. Silver B, Ramaiya K, Andrew SB, et al. EADSG guidelines insulin therapy in diabetes. *Diabetes therapy*. 2018; 9: 449-492.
22. Ong WM, Chua SS, Ng CJ. Barriers and facilitators to self-monitoring of blood glucose in people with type 2 diabetes using insulin a qualitative study. *Patient preference and adherence*. 2014; 8: 237.
23. Aleali AM, Payami SP, Latifi SM, et al. Evaluation of psychological resistance to insulin treatment in type II diabetic

- patients. *Diabetes & Metabolic Syndrome. Clinical Research & Reviews*. 2018; 12: 929-932.
24. Jha S, Panda M, Kumar S, et al. Psychological insulin resistance in patients with type 2 diabetes. *The Journal of the Association of Physicians of India*. 2015; 63: 33-39.
25. Wu YZ, Wang WJ, Feng NP, et al. Validity reliability and acceptability of the brief version of the self-management knowledge attitude and behavior assessment scale for diabetes patients. *Chinese journal of preventive medicine*. 2016; 50: 589-593.
26. Joyce PY, Jean CY, Vitaliano PP, et al. How does anger coping style affect glycemic control in diabetes patients. *International Journal of Behavioral Medicine*. 2018; 15: 167.
27. Song SH, Hardisty CA. Early onset type 2 diabetes mellitus a harbinger for complications in later years clinical observation from a secondary care cohort. *QJM An International Journal of Medicine*. 2009; 102: 799-806.
28. Bayrak B, Dedeli Çaydam Ö. Evaluation of insulin injection fear of finger piercing and metabolic control variables in diabetic individuals. *Nursing Forum Journal in Diabetes. Obesity and Hypertension*. 2019; 11: 12-18.
29. Kalyon S, Gümüşkaya PÖ, Özsoy N, et al. Delay in starting insulin therapy in patients with type 2 Diabetes Mellitus. *Journal of Surgery and Medicine*. 2020; 4: 685-688.
30. Russell-Jones D, Pouwer F, Khunti K. Identification of barriers to insulin therapy and approach to overcome them. *Diabetes Obesity and Metabolism*. 2018; 20: 488-496.
31. Soyler P, Kadioglu BU, Kilic KN. Barriers to initiation of insulin in patients with type 2 diabetes based on health belief model Pinar Soyler. *European Journal of Public Health*. 2017; 27.
32. Soyler P, Kadioglu BU, Kilic K. Investigation of the barriers about insulin therapy in patients with type 2 diabetes. *Nigerian Journal of Clinical Practice*. 2020; 23: 98.
33. Torabian F, Mostafavian Z, Ghareh S, et al. Data on insulin therapy refusal among type II diabetes mellitus patients in Mashhad Iran. *Data in brief*. 2018; 18: 2047-2050.
34. Rubin RR, Peyrot M, Kruger DF, et al. Barriers to insulin injection therapy. *The Diabetes Educator*. 2019; 35: 1014-1022.
35. Khan H, Lasker SS, Chowdhury TA. Prevalence and reasons for insulin refusal in Bangladeshi patients with poorly controlled Type 2 diabetes in East London. *Diabetic Medicine*. 2008; 25: 1108-1111.
36. American Diabetes Association. Facilitating Behavior Change and Well-being to Improve Health Outcomes Standards of Medical Care in Diabetes 2020. *Diabetes Care*. 2020c; 43: S48-S65.
37. Ghanbari A, Yekta ZP, Roushan ZA, et al. Assessment of factors affecting quality of life in diabetic patients in Iran. *Public Health Nursing*. 2005; 22: 311-322.
38. Düzöz GT, Çatalkaya D, Uysal DD. Evaluation of self-care ability of patients with type 2 diabetes mellitus. *New Medical Journal*. 2009; 26: 210-213.
39. Aslan Ü, Korkmaz M. Insulin Application Knowledge-Skill Levels of Individuals with Diabetes Right and Wrongs. *Dokuz Eylül University Faculty of Nursing Electronic Journal*. 2015; 8.