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Research Article

Attitudes and behaviors of patients with diabetes towards insulin treatment

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ABSTRACT

Objective: Insulin treatment for diabetes helps prevent complications. The views and attitudes of people with diabetes towards insulin have a significant impact on treatment adherence and health outcomes. This study aimed to understand the attitudes of people with diabetes towards insulin treatment and the psychosocial factors associated with them.

Methods: The study included 225 patients who applied to the Diabetes-Obesity Outpatient Clinic of a tertiary hospital, who were diabetic, using insulin and/or oral antidiabetic drugs (OAD), over 18 years of age, not pregnant, and able to self-inject. The patient identification form, the DASS-21, and the ITAS scales were used to collect data.

Results: In our study, the mean positive attitude of the ITAS was 9.51; the mean negative attitude of the ITAS was 41.28; and the mean total score of the ITAS was 50.80. Anxiety was observed in 54.7% of the participants, depression in 44.4%, and stress in 30.7%. There was a positive correlation between age and ITAS total score ($r=0.405$; $p<0.001$). Negative ITAS attitude and ITAS total score were found to be higher in women ($p=0.022$ and $p=0.034$), in patients with type 2 diabetes ($p<0.001$; $p<0.001$), and in patients who had not received diabetes education ($p=0.002$; $p=0.001$). The total and negative attitude scores of patients using only OAD were higher than those using insulin ($p<0.001$).

Conclusion: In our study, we found that being a woman, being older, not having received diabetes education, having a short duration of diabetes, and using only OAD were associated with negative attitudes towards insulin in people with diabetes. We also found that depression, anxiety, and stress levels were significantly higher in women and people with low income.

Keywords: Diabetes mellitus, insulin, attitude, behavior, depression

Introduction

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by the body's inability to utilize the insulin it produces effectively, or by the pancreas' inability to produce sufficient quantities of insulin.[1] DM is classified into two principal categories. Type 1 diabetes typically manifests during childhood or early adulthood and is characterized by an autoimmune response that results in the destruction of beta cells within the pancreas.[2] Type 2 diabetes, which is caused by

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insulin resistance and a reduction in the pancreas' capacity to produce insulin, is more prevalent in adults.[3] The prevalence of DM is increasing rapidly on a global scale. It is estimated that there are currently approximately 537 million individuals with DM worldwide, with this figure projected to reach 783 million by 2045.[4] However, the prevalence of DM in Türkiye is approximately 14.7%, which represents a significant burden on the country's health system.[5]

DM and its associated complications have a profound impact on patients' quality of life and contribute to the rising costs of healthcare.[6] The fundamental elements of DM treatment are regular monitoring blood sugar levels, regular physical activity, a balanced diet, and medication.[1] Insulin treatment is a requisite component of the management of type 1 diabetes, and it is also commonly indicated for patients with type 2 diabetes.[7] Maintaining optimal blood sugar levels is crucial for preventing acute and long-term complications associated with DM. Insulin treatment plays a pivotal role in this regard. Nevertheless, the attitudes and behaviors of patients undergoing insulin treatment a are strongly linked to the effectiveness of the treatment regimen.[8] The views and attitudes of patients with DM regarding insulin have been demonstrated to exert a significant impact on treatment compliance and health outcomes.[9] For instance, apprehension regarding insulin injections, perceiving the commencement of insulin therapy as an indication of inadequacy, or concerns about social stigma may diminish patients' adherence to treatment regimens.[10] Furthermore, the lifestyle modifications necessitated by insulin therapy may prove challenging for patients to integrate into their daily routines.[11] In multicultural societies, it is of great importance to investigate attitudes and behaviors toward insulin to facilitate treatment adherence and improve patient education programs.[12] Investigating the attitudes and behaviors of diabetic patients in Türkiye concerning insulin treatment will prove invaluable in addressing the current deficit of information in the field of health and in informing the development of health policies.[13]

The objective of this study is to examine the attitudes and behaviors of diabetic patients who have sought treatment at the Diabetes-Obesity Outpatient Clinic concerning insulin treatment. Additionally, the study seeks to ascertain the patients' knowledge levels, apprehensions, and concerns pertaining to their treatment, as well as to investigate the impact of depression, stress, and anxiety on these attitudes and behaviors.

Material and Methods

This study employed a cross-sectional design and was conducted at the Diabetes-Obesity Outpatient Clinic of a tertiary hospital in Istanbul between 15/10/2023 and 15/04/2024.

During the last six-month period before the study period, approximately 750 unique diabetic patients applied to the outpatient clinic. Based on this known population, the required sample size was calculated using a finite population correction with a 95% confidence level and 5% margin of error. Accordingly, the target sample size was determined as 254; however, complete data were obtained from 225 patients. Participants were selected using a simple random sampling method from among those meeting the inclusion criteria. Individuals diagnosed with type 1 or type 2 diabetes, aged 18 or above, who being treated with insulin and/or oral antidiabetic drugs (OADs) and who consented to participate in the study were included in this investigation. Of the participants, 75 were on OADs alone, 75 were on a combination of OADs and insulin therapy, and 75 were on insulin monotherapy.

To be eligible for inclusion in the study, participants were required to demonstrate the cognitive ability to answer the questions posed, to have been diagnosed with DM (either Type 1 or Type 2), to be undergoing DM treatment (with OADs and/or insulin), to have no underlying health conditions that would preclude participation in the interview, to be able to understand and communicate effectively in Turkish, to be at least 18 years of age during the period of the study, and to have given their informed consent to participate in the study.

The exclusion criteria for the study were defined as follows: Those under the age of 18 during the study period, pregnant women, individuals with conditions that impair the ability to self-administer injections (e.g., neurological involvement, vision loss), patients unable to comprehend Turkish and communicate effectively, those unable to respond to 90% of survey items, those who declined to participate, individuals with acute medical emergencies, and those with perceptual or psychiatric disorders that impair communication were not eligible.

Approval from the İstanbul Medeniyet University Göztepe Training and Research Hospital Clinical Research Ethics Committee was obtained on 11 October 2023 (decision number 2023/0690). This study was conducted in accordance with the Declaration of Helsinki and with the approval of the institutional review board. Informed consent was obtained from all patients before their participation.

The Patient Identification Form, the Depression Anxiety Stress Scale-21 (DASS-21), and the Insulin Treatment Appraisal Scale (ITAS) were administered to the volunteer patients in person. The patient identification form inquired about the patients' sociodemographic characteristics, the presence of additional chronic diseases, the type of treatment, the duration of treatment, and the duration of diabetes.

The ITAS is a scale comprising two sub-dimensions and a total of 20 items. Four of the items (items 3, 8, 17 and 19) assess positive attitudes, while the remaining 16 items assess negative attitudes. A high positive assessment score is indicative of a positive attitude towards insulin, whereas a high total score and negative assessment score are indicative of a negative perception of insulin use.[14] The Turkish validity and reliability study was conducted by Arda-Sürücü et al. and the necessary permissions were obtained from them to use the scale in our study.[15]

The DASS-21 was employed to measure symptoms of depression, anxiety and stress in patients. The scale comprises 21 items divided equally into three subscales: depression, anxiety, and stress. A high score on the DASS-21 indicates an increase in the severity of symptoms.[16] The Turkish validity and reliability study of the scale was conducted by Sarıçam[17] The necessary permissions were obtained from them for the scale to be used in the present study.

Data were analyzed using IBM SPSS Statistics (Version 22.0). Descriptive analyses were conducted using the following statistical measures: number (n), percentage (%), mean, standard deviation, and median value. The normality of the distribution was evaluated using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The following tests were employed for comparison: Pearson chi-square test, independent groups T-test, Mann-Whitney U-test, one-way ANOVA test, and Kruskal-Wallis test. Tukey's post hoc test was used to identify specific group differences, while the Mann-Whitney U test was used to identify the group(s) that exhibited statistical significance. In the case of post-hoc Mann-Whitney U tests, the Dunn-Bonferroni correction was applied to the p-values. In instances where the data in question did not demonstrate a normal distribution, a Spearman correlation analysis was employed to ascertain the nature of the relationship between

the two numerical variables. The threshold for statistical significance was set at p<0,05 for all tests employed in the course of the research.

Results

The study cohort comprised 225 patients diagnosed with DM who had sought care at the diabetes-obesity outpatient clinic.

Table 1 presents a summary of the sociodemographic and clinical characteristics of all participants. The median age of the participants was 56 years (IQR: 46–64). The sample was predominantly female (66.2%). Regarding educational background, 40.9% of participants had completed primary school, while 23.1% had a university degree. A smaller portion of the sample was literate without formal education (1.8%) or had completed other forms of education (4.9%). Occupationally, nearly half of the participants were housewives (47.1%), followed by retirees (22.7%) and freelance workers (12.4%). In terms of income, 60.0% of participants reported that their income matched their expenses, while 18.2% indicated that their income was insufficient and 21.8% reported a surplus. The clinical profile showed that the vast majority had Type 2 diabetes (80.4%) with a mean disease duration of 15.30 ± 10.01 years. Furthermore, 81,3% of the sample had additional chronic conditions.

Regarding comorbidities, 81.3% of participants reported having other chronic diseases reported having other chronic diseases in addition to DM. Specifically, 14.7% had coronary artery disease, 58.2% had hyperlipidemia, 52.9% had hypertension, 4.9% had chronic lung disease, 6.7% had kidney disease, and 16% had thyroid disease. Additionally, 12% of the participants reported having unspecified chronic conditions.

While 69.8% of participants had received diabetes education, treatment methods varied: one-third used only oral antidiabetic agents, another third used only insulin, and the remaining third used a combination of both. Among insulin users (n=150), the average duration of insulin therapy was 13.81 ± 8.99 years. Most participants used insulin either twice (28.7%) or four times daily (36.7%). Notably, 97.3% of insulin users reported adherence to their insulin therapy regimen.

Table 2 presents the distribution of the ITAS sub-dimensions and total scores of diabetic patients according to their sociodemographic and clinical characteristics. No statistically significant correlation was found between age and the ITAS sub-dimensions; however, a moderate positive correlation was identified between age and total ITAS scores (r=0.405, p<0.001), suggesting that insulin attitudes become more favorable with advancing age. Regarding gender, women had significantly higher negative attitude scores (p=0.022), and total ITAS scores were also significantly higher among women (p=0.034). Educational status showed significant differences in both the negative attitude and total ITAS scores (p<0.001; p=0.004). The difference in the negative attitude sub-dimension was due to secondary school graduates scoring lower than primary and other education groups (p=0.003, p=0.001), while the difference in the ITAS total score was due to university graduates scoring lower than the other group (p=0.023). In terms of occupation, significant differences were found in both negative attitudes (p=0.003), and total scores (p=0.004). The higher negative attitude scores of housewives (p=0.005) and the higher ITAS total scores of housewives and self-employed patients (p=0.008; p=0.040) accounted for the differences. Housewives and freelancers tended to have more negative perceptions compared to those grouped under “Others” (including workers, officers, and unemployed individuals). Although monthly income levels were not significantly associated with ITAS scores, a decreasing trend was observed in negative and total scores as income increased.

Table 1. Sociodemographic and clinical characteristics of the participants

Variables (n=225)	Categories	Results (n (%))
Age (years)		56.00 (46.00-64.00)*
Gender	Female	149 (66.2)
	Male	76 (33.8)
Education	Literate	4 (1.8)
	Primary school	92 (40.9)
	Middle school	23 (10.2)
	High school	43 (19.1)
	University	52 (23.1)
	Others	11 (4.9)
Vocation	Housewife	106 (47.1)
	Retired	51 (22.7)
	Freelance	28 (12.4)
	Officer	5 (2.2)
	Worker	2 (0.9)
	Unemployed	1 (0.4)
	Others	32 (14.2)
Monthly income bracket	Income is less than expenses	41 (18.2)
	Income level equals expense	135 (60.0)
	Income is more than expenses	49 (21.8)
Diabetes type	Type 1 DM	44 (19.6)
	Type 2 DM	181 (80.4)
Diabetes duration (years)		15.30 ± 10.01**
Other chronic diseases	No	42 (18.7)
	Yes	183 (81.3)
Diabetes education	No	68 (30.2)
	Yes	157 (69.8)
Diabetes treatment	Oral Antidiabetic	75 (33.3)
	Insulin	75 (33.3)
	Oral Antidiabetic+Insulin	75 (33.4)
Duration of insulin use (years) (n=150)		13.81 ± 8.99**
Number of insulin uses (n=150)	1	42 (28.0)
	2	43 (28.7)
	3	6 (4.0)
	4	55 (36.7)
	5	4 (2.6)
Does he/she use insulin therapy properly? (n=150)	No	4 (2.7)
	Yes	146 (97.3)

*Median (Minimum-Maximum); **Mean ± Standard Deviation.

Table 2. ITAS scores by sociodemographic and clinical characteristics

Variables (n=22)	Categories	ITAS Positive Attitude Sub-Dimension	p	ITAS Negative Attitude Sub-Dimension	p	ITAS Total	p
Age (years)		r=0.030	0.653*	r=0.081	0.228*	r=0.405	**<0.001***
Gender	Female	10.00 (8.00-11.00)	0.582**	42.49±10.88	**0.022*****	51.98±11.63	**0.034****
	Male	9.00 (7.00-11.00)		38.93±10.96		48.51±11.35	
Education	Literate	10.00 (8.50-10.75)	0.354****	41.66±9.86	**<0.001******	52.00±9.53	**0.004******
	Primary school	10.00 (8.00-11.00)		43.61±9.78		52.89±10.60	
	Middle school	10.00 (8.00-14.00)		34.47±10.69		46.00±10.61	
	Highschool	9.00 (8.00-12.00)		40.90±11.83		50.60±12.64	
	University	9.00 (7.25-11.00)		38.53±10.43		47.53±11.59	
	Others	10.00 (8.00-10.00)		50.36±11.47		59.36±11.96	
Vocation	Housewife	10.00 (8.00-11.00)	0.306****	43.59±11.03	**0.003******	52.90±12.02	**0.004******
	Retired	9.00 (7.00-11.00)		39.17±10.42		48.66±10.88	
	Freelance	10.00 (8.25-12.00)		42.85±10.57		53.57±9.27	
	Others (Worker+Officer+ Unemployed+Others)	9.00 (7.25-11.00)		36.82±10.47		46.10±11.45	
Monthly income bracket	Income is less than expenses	9.00 (8.00-12.00)	0.667****	42.70±11.72	0.411******	54.00 (44.50-59.50)	0.428****
	Income level equals expense	10.00 (8.00-11.00)		41.44±10.88		50.50 (42.00-60.00)	
	Income is more than expenses	9.00 (7.00-12.00)		39.65±10.77		49.00 (40.50-58.00)	
Diabetes type	Type 1 DM	9.00 (7.00-10.75)	0.128**	33.75±10.41	**<0.001*****	42.84±11.92	**<0.001*****
	Type 2 DM	10.00 (8.00-11.00)		43.12±10.37		52.75±10.72	
Diabetes duration (years)		r=-0.060	0.369*	r=-0.198	**0.003***	r=–0.198	**0.003***
Other chronic diseases	No	9.00 (6.75-12.00)	0.927**	39.21±12.05	0.177***	48.78±12.58	0.212***
	Yes	9.00 (8.00-11.00)		41.76±10.74		51.27±11.39	
Diabetes education	No	10.00 (8.00-11.00)	0.298**	44.67±11.04	**0.002*****	54.58±10.80	**0.001*****
	Yes	9.00 (8.00-11.00)		39.80±10.70		49.16±11.62	
Duration of insulin use (years) (n=150)		r=-0.089	0.277**	r=-0.104	0.206**	r=-0.116	0.159**
Number of insulin uses (n=150)		r=0.002	0.979**	r=-0.111	0.176**	r=-0.083	0.313**

Bold values indicate statistical significance.
r= Spearman correlation coefficient
*: Spearman correlation test; **: Mann Whitney U test; ***: Independent Samples T test; ****: Kruskal Wallis test; *****: One Way ANOVA test.

Among clinical variables, individuals with Type 2 diabetes had significantly higher negative attitude and total ITAS scores compared to those with Type 1 diabetes (p<0.001). A negative correlation was found between diabetes duration and both negative attitude and total ITAS scores (r=-0.198; p=0.003). Participants who had received diabetes education had significantly lower negative attitude scores (p=0.002) and lower total ITAS scores (p=0.001). In addition, when other chronic diseases were examined separately, it was observed that the ITAS negative attitude and ITAS total score were higher in patients with hypertension than in patients without hypertension (p=0.015; p=0.041).

No statistically significant associations were observed between ITAS scores and other clinical variables such as the presence of chronic diseases, number of insulin injections per day, or insulin therapy duration.

Table 3 presents the distribution of the DASS-21 depression, anxiety and stress scores according to the sociodemographic and clinical characteristics of the patients. No statistically significant correlation was found between age and the DASS-21 subscale scores. However, females had significantly higher depression (p=0.005) and anxiety (p<0.001) scores, while the difference in stress scores did not reach statistical significance (p=0.091). When educational status was evaluated, a significant difference was found only in anxiety scores (p=0.010), with the highest levels observed among those categorized as “Literate” and “Others”. Occupational status was associated with depression and anxiety scores. Housewives exhibited higher scores compared to other groups, with significant differences in depression (p=0.046), and anxiety (p<0.001) subscales. Monthly income level was significantly associated with all three DASS-21 subscales. Participants with income lower than their expenses reported the highest levels of depression, anxiety, and stress, whereas those with income higher than expenses had the lowest levels across all domains (p<0,05 for all comparisons).

Among clinical variables, there were no significant differences in DASS-21 scores between Type 1 and Type 2 diabetes. However, a weak but statistically significant positive correlation was found between diabetes duration and anxiety scores (r=0.154; p=0.021), indicating that longer diabetes duration may be associated with slightly increased anxiety. No statistically significant associations were found between DASS-21 scores and the presence of other chronic diseases, diabetes education, duration of insulin use, or number of insulin administrations per day.

Table 4 shows the distribution of ITAS and DASS-21 scores according to the treatment method employed for diabetic patients included in the study. Significant differences were found in insulin treatment attitude scores across treatment groups. Participants receiving only OAD had almost significantly higher positive attitude scores compared to those receiving insulin alone or a combination of OAD and insulin (p=0,050). More strikingly, negative attitude and total scores differed significantly between groups (p<0.001), for both with OAD users scoring the highest, followed by combination therapy users, and insulin-only users showing the lowest negativity.

In contrast, DASS-21 scores did not differ significantly by treatment type. Median scores for depression, anxiety, and stress were similar across groups, with no statistically significant differences observed (p>0.05 for all).

After all this, the relationship between the ITAS sub-dimensions, total scores of the ITAS, and the DASS-21 scores has been evaluated, and shown in Table 5. The results indicated a moderate positive relationship between ITAS total scores and each of the DASS-21 subscales. Specifically, higher total ITAS scores were associated with elevated levels

Table 3. DASS-21 scores by sociodemographic and clinical characteristics

Variables (n=22)	Categories	DASS-21 Depression Score	p	DASS-21 Anxiety Score	p	DASS-21 Stress Score	p
Age (years)		r=-0.125	0.061*	r=-0.100	0.133*	r=-0.087	0.193*
Gender	Female	5.00 (1.00-7.50)	**0.005****	5.00 (2.50-8.00)	**<0.001****	6.00 (3.00-8.50)	0.091**
	Male	2.00 (1.00-6.00)		2.00 (1.00-4.00)		5.00 (2.00-8.00)	
Education	Literate	8.50 (1.75-13.75)	0.265***	7.00 (1.75-11.50)	**0.010*****	5.00 (1.25-8.75)	0.257***
	Primary school	3.50 (1.00-7.00)		4.00 (2.00-7.75)		6.00 (3.00-8.00)	
	Middle school	3.00 (0.00-7.00)		2.00 (1.00-5.00)		5.00 (3.00-7.00)	
	Highschool	4.00 (1.00-7.00)		4.00 (2.00-5.00)		5.00 (2.00-8.00)	
	University	3.50 (1.00-8.75)		4.00 (2.00-7.00)		4.50 (3.00-8.00)	
	Others	7.00 (3.00-8.00)		7.00 (6.00-11.00)		7.00 (6.00-11.00)	
Vocation	Housewife	5.00 (2.00-7.00)	**0.046*****	5.50 (3.00-8.00)	**<0.001*****	6.00 (3.00-8.25)	0.178***
	Retired	3.00 (0.00-6.00)		2.00 (2.00-4.00)		5.00 (2.00-8.00)	
	Freelance	3.00 (1.00-7.00)		4.00 (1.00-7.00)		6.00 (3.00-8.00)	
	Others (Worker+Officer+ Unemployed+Others)	3.50 (1.00-7.00)		3.50 (2.00-7.00)		5.00 (3.00-8.00)	
Monthly income bracket	Income is less than expenses	4.00 (2.50-7.00)	**0.025*****	6.00 (2.00-10.00)	**0.005*****	7.00 (3.00-11.00)	**0.039*****
	Income level equals expense	4.00 (1.00-7.00)		4.00 (2.00-7.00)		6.00 (3.00-8.00)	
	Income is more than expenses	2.00 (0.50-5.00)		3.00 (1.00-5.50)		4.00 (2.00-8.00)	
Diabetes type	Type 1 DM	4.00 (1.00-6.75)	0.873**	3.50 (2.00-7.00)	0.430**	5.00 (3.00-8.00)	0.562**
	Type 2 DM	4.00 (1.00-7.00)		4.00 (2.00-7.00)		6.00 (3.00-8.00)	
Diabetes duration (years)		r=0.106	0.114*	r=0.154	**0.021***	r=0.039	0.560*
Other chronic diseases	No	3.50 (1.00-7.00)	0.871**	3.00 (1.00-7.00)	0.252**	6.00 (3.00-8.00)	0.961**
	Yes	4.00 (1.00-7.00)		4.00 (2.00-7.00)		6.00 (3.00-8.00)	
Diabetes education	No	3.00 (1.00-7.00)	0.372**	3.00 (2.00-7.00)	0.106**	6.00 (2.25-8.75)	0.716**
	Yes	4.00 (1.00-7.00)		4.00 (2.00-7.00)		5.00 (3.00-8.00)	
Duration of insulin use (years) (n=150)		r=0.102	0.216*	r=0.074	0.367*	r=-0.074	0.368*
Number of insulin uses (n=150)		r=0.114	0.165*	r=0.014	0.865*	r=0.025	0.757*

Bold values indicate statistical significance.
r= Spearman correlation coefficient
*: Spearman correlation test; **: Mann Whitney U test; ***:Kruskal Wallis test

Table 4. ITAS and DASS-21 scores according to treatment type

Variables	OAD (n=75) (Mean±SD or Median (Minimum-Maximum))	Insulin (n=75) (Mean±SD or Median (Minimum-Maximum))	OAD+Insulin (n=75) (Mean±SD or Median (Minimum-Maximum))	p
ITAS Positive Attitude Sub-Dimension	10.16±2.89	9.30±3.02	9.08±2.54	0.050*
ITAS Negative Attitude Sub-Dimension	45.14±10.93	37.44±10.81	41.21±10.04	**<0.001***
ITAS Total	55.30±10.73	46.77±11.98	50.29±10.66	**<0.001***
DASS-21 Depression Score	4.00 (1.00-8.00)	4.00 (1.00-7.00)	4.00 (1.00-7.00)	0.688**
DASS-21 Anxiety Score	3.00 (2.00-7.00)	4.00 (2.00-8.00)	4.00 (2.00-7.00)	0.235**
DASS-21 Stress Score	6.00 (2.00-8.00)	6.00 (3.00-8.00)	5.00 (3.00-8.00)	0.966**

Bold values indicate statistical significance.
*: One Way ANOVA test; **: Kruskal Wallis Test.

Table 5. Correlations of ITAS and DASS-21 scores

Variables		ITAS Positive Attitude Sub-Dimension	ITAS Negative Attitude Sub-Dimension	ITAS Total	DASS-21 Depression Score	DASS-21 Anxiety Score	DASS-21 Stress Score
ITAS Positive Attitude Sub-Dimension	**r**	-	0.218	0.405	0.037	0.035	-0.039
	p		**<0.001**	**<0.001**	0.580	0.604	0.558
ITAS Negative Attitude Sub-Dimension	**r**	0.218	-	0.975	0.288	0.325	0.254
	p	**<0.001**		**<0.001**	**<0.001**	**<0.001**	**<0.001**
ITAS Total	**r**	0.405	0.975	-	0.283	0.329	0.188
	p	**<0.001**	**<0.001**		**<0.001**	**<0.001**	**0.005**
DASS-21 Depression Score	**r**	0.037	0.288	0.283	-	0.692	0.637
	p	0.580	**<0.001**	**<0.001**		**<0.001**	**<0.001**
DASS-21 Anxiety Score	**r**	0.035	0.325	0.329	0.692	-	0.720
	p	0.604	**<0.001**	**<0.001**	**<0.001**		**<0.001**
DASS-21 Stress Score	**r**	-0.039	0.254	0.188	0.637	0.720	-
	p	0.558	**<0.001**	**0.005**	**<0.001**	**<0.001**	

Bold values indicate statistical significance
*: Spearman correlation test

of depression (r=0.283; p<0.001), anxiety (r=0.188; p=0.005), and stress (r=0.329; p<0.001). The ITAS negative attitude scores were positively and significantly correlated with all DASS-21 domains. Participants with higher negative attitude scores tended to report higher depression (r=0.288; p<0.001), anxiety (r=0.254; p<0.001), and stress scores (r=0.325; p<0.001). Conversely, ITAS positive attitude scores were not significantly associated with any of the DASS-21 subscales.

Discussion

In this study, we examined the attitudes of diabetic patients toward insulin use and the relationship between depression, anxiety, and stress levels. Our findings indicate that several demographic and clinical factors are associated with negative attitudes toward insulin. Specifically, we found that being a woman, being older, not having received DM education, having a low level of education,

having a short duration of DM and using only oral antidiabetic drugs were associated with negative attitudes towards insulin. Additionally, the prevalence of depression was markedly elevated among women and individuals with lower income levels.

In our study, the mean score for the positive attitude sub-dimension of the ITAS was 9.51±2.85; the mean score for the negative attitude sub-dimension of the ITAS was 41.28±1.01; and the mean score for the total ITAS score was 50.80±11.63. Similarly, studies conducted in Türkiye reported higher mean scores than those observed in our study.[11,18,19] In the study conducted by Günay and his team, in which the perceptions of Type 2 diabetic patients receiving intensive care treatment towards insulin were investigated, it was observed that the mean total score of the ITAS was similar to that observed in our study.[20] In studies conducted in other countries, it was observed that the total scores of the ITAS were lower than those reported in our study.[21,22] Furthermore, in another investigation involving 273 Type 2 diabetic patients undergoing insulin treatment, it was observed that the positive attitude scores were higher than those reported in our study.[23]

A comparison of our study with other studies indicates that our patients exhibited a more negative attitude towards insulin. This negative attitude may be attributable to demographic factors, such as the lower proportion of younger patients participating in the study and the majority of participants being female. Furthermore, the higher proportion of patients with a lower level of education in our study compared to those with a higher level of education may have contributed to this negative attitude.

The findings of our study indicated that women with diabetes exhibited a more negative attitude toward insulin treatment compared to men. The results of a study conducted with Type 2 DM patients who did not use insulin to evaluate the emotional and cognitive barriers (psychological insulin resistance) that individuals experience in accepting insulin treatment supported the findings of our study.[24] Furthermore, studies have reported that positive and negative perceptions of insulin treatment are not inherently gender specific. Some studies have found that male and female patients exhibit similar perceptions of insulin treatment, with both positive and negative attitudes reported.[11,18-20,25-28] In light of the aforementioned findings, it can be posited that the higher rates of depression and anxiety observed in female patients in our study may have contributed to their more negative attitudes towards insulin.

It was established that patients with DM who had achieved a basic level of literacy exhibited a more unfavorable attitude toward insulin treatment than those who had attained a higher level of education.[18] In the study conducted by Taylor et al. it was observed that participants who had not completed high school education exhibited a more negative attitude towards insulin than those with a higher level of education.[25] In the study conducted by Saleem, it was established that patients who had received a university education exhibited the highest levels of positive perception towards insulin; conversely, patients who were illiterate or had only received religious education demonstrated significantly lower levels of positive perception.[29] In the study conducted by Tan et al. it was determined that participants with at least a secondary level of education were less likely to decline insulin treatment compared to those who had only completed primary school or were uneducated.[30] In the study conducted by Wong et al. it was observed that patients with a university level of education were more inclined to utilize insulin treatment than those who had completed primary or secondary school.[31]

In line with the aforementioned studies, our study revealed that patients with no formal education exhibited a more negative attitude toward insulin

than those with a university-level education. A lack of education may have resulted in patients having inadequate health literacy, which may have led to a lack of knowledge and the formation of false beliefs about insulin treatment. It can be assumed that patients developed a negative attitude towards insulin treatment as a result of this lack of knowledge and false beliefs.

Our findings also showed that a notable discrepancy between age and attitudes towards insulin treatment. It was observed that there was a correlation between age and attitude towards insulin treatment, with older patients displaying a more negative attitude towards insulin. One of the sources of evidence supporting these findings is a study conducted in Australia. The study examined a small cohort of patients with type 2 diabetes who were not adequately controlled on a non-insulin regimen. The findings indicated that individuals with diabetes over the age of 50 exhibited a more unfavorable attitude toward insulin utilization.[25] Nevertheless, numerous studies published in the scientific literature have not identified a statistically significant correlation between age and attitudes toward insulin treatment.[11,18-20,26] The reason for this significant difference found in our study can be interpreted as individuals developing negative attitudes towards insulin based on the negative processes and experiences they have undergone as they have aged. Several studies that have sought to evaluate the attitude toward insulin in patients with DM have not identified a significant relationship between the duration of DM and this attitude.[18,19,23,26,28,31,32] However, in the study conducted by Tan et al. which investigated insulin treatment refusal using a questionnaire developed for patients with Type 2 DM, it was determined that the rate of refusal of insulin treatment decreased by 9% per year with increasing duration of diabetes.[30]

Similarly, our study revealed that patients exhibited a more favorable attitude towards insulin treatment as the duration of DM diagnosis increased. It is hypothesized that as the number of patients in our study increased, the probability of interaction with healthcare professionals and receipt of regular education also increased. This suggests that the patients may have acquired greater knowledge and experience regarding their diabetes. Furthermore, they may have psychologically adapted to their condition over time, leading to a more positive approach to living with DM and the associated treatment processes. This process of acceptance and adaptation may have reduced the tendency to reject or postpone insulin treatment, thereby developing a more positive attitude toward the treatment in question.

The findings of our study revealed a notable discrepancy between the DM treatment groups and their attitudes toward insulin. It was observed that patients who were receiving only oral antidiabetic drugs exhibited a more negative attitude towards insulin treatment than patients who were receiving only insulin or a combination of oral antidiabetic drugs and insulin. This finding is consistent with the results of numerous studies previously conducted in the literature. A study examining psychological insulin resistance (PIR) in geriatric patients revealed that patients who were not using insulin exhibited a more negative attitude than patients who were using insulin.[13] Similarly, a study conducted on diabetic patients receiving primary health care in Hong Kong revealed that patients not using insulin exhibited higher levels of psychological insulin resistance than those using insulin.[33] In the study conducted by Chen et al. it was stated that patients with type 2 DM who were using the OADs exhibited more negative beliefs and attitudes toward insulin treatment than those who were currently receiving insulin treatment.[27] In the study conducted by Gulam et al. patients receiving insulin treatment exhibited a less negative attitude towards insulin treatment than those using the OADs.[26] Ultimately, the study by Hermanns et al. unequivocally

demonstrated that the obstacles to insulin therapy intensified in patients who continued to adhere to oral treatment regimens, whereas the negative perceptions of insulin therapy diminished in patients who transitioned to insulin therapy.[22]

The studies corroborate the findings of our investigation. It seems plausible to suggest that patients who have undergone insulin treatment tend to exhibit fewer negative attitudes because of having acquired the requisite skills to cope with and adapt to insulin. Conversely, it is postulated that patients solely treated with oral antidiabetic drugs were inadequately informed and educated about insulin treatment, consequently exhibiting a more unfavorable disposition towards insulin therapy.

The findings of this study indicate that patients who did not receive DM education exhibited a more unfavorable attitude toward insulin treatment in comparison to those who received such education. Despite the dearth of studies in the literature that directly address the effect of DM education on attitudes toward insulin treatment, like our study, some studies conducted in recent years have demonstrated that DM education has a positive impact on patients' general health management, adherence to treatment and quality of life. Norris et al. have demonstrated that DM education is an effective strategy for improving glycemic control in both the short and long term, while also enhancing patients' knowledge and skills regarding DM management.[34] Similarly, Gucciardi et al. have stated that DM education increases patients' self-management skills and adherence to treatment and that this education may positively affect patients' attitudes toward insulin treatment.[35] Furthermore, Ahola and Groop have highlighted the pivotal role of education in mitigating psychological resistance among diabetic patients.[36] Their findings indicate that this educational intervention may foster a more constructive outlook by attenuating negative thoughts and concerns about treatment. In this context, the findings of our study offer valuable insights into the potential of DM education to enhance patients' attitudes toward insulin treatment.

Despite the absence of a notable correlation between the prevalence of additional chronic illnesses and attitudes toward insulin, depression, anxiety, and stress in our investigation, our findings indicate that patients with hypertension tend to exhibit a more unfavorable attitude toward insulin. Furthermore, elevated levels of anxiety and stress were observed in this patient cohort. A study including patients with DM and/or hypertension observed a high prevalence of depression and anxiety disorders.[8] Furthermore, another study indicated that type 2 DM was associated with an elevated prevalence of depression and/or anxiety disorders in patients with hypertension.[37] Similarly, a study comparing healthy groups with patients with type 2 DM demonstrated that the presence of hypertension was identified as a risk factor for depression, anxiety, and stress.[38] The results of our study indicate that hypertension may have a detrimental impact on attitudes toward insulin in individuals with DM, potentially leading to an increased psychological burden. Nevertheless, further in-depth analysis is required to provide more detailed commentary.

Many studies have failed to identify a correlation between insulin treatment and the occurrence of depression, anxiety, and stress. In the study conducted by Lee it was concluded that depression was not a significant factor in psychological insulin resistance.[33] In the study conducted by Nefs et al. with type 2 diabetic patients who did not use insulin, no relationship was found between the rate and duration of insulin treatment and depression.[39] In the study by Fisekovic Kremic examining the relationship between the DASS-21 and sociodemographic and clinical characteristics in diabetic patients, no significant

relationship was identified between diabetes treatments and depression, anxiety and stress status.[40] Furthermore, the study by Habtewold et al. investigating the relationship between depression and type 2 diabetic patients revealed no significant correlation between DM treatment regimens and depression.[41] Per the existing literature, our study revealed no statistically significant correlation between DM treatment types and depression, anxiety, and stress. This finding may indicate that depression, anxiety and stress do not exert a direct influence on the management of DM treatment.

Limitations

This study has several limitations. First, its cross-sectional design restricts the ability to draw causal inferences between patients' attitudes toward insulin therapy and psychosocial variables such as depression, anxiety, and stress. Additionally, the study was conducted in a single tertiary hospital in Istanbul, which may limit the generalizability of the findings to broader populations with diverse cultural and socioeconomic backgrounds.

Second, the use of self-reported data may have introduced recall or reporting bias, particularly regarding mental health measures. Although validated tools were used, variables such as fear of hypoglycemia or patient-provider communication—which may significantly influence insulin attitudes—were not assessed. Moreover, as the sample primarily included individuals with Type 2 diabetes, the results may not fully reflect the experiences of those with Type 1 diabetes.

Conclusion

The study found that being a woman, being older, having a low level of education and not having received diabetes education were associated with negative attitudes towards insulin use. Low income, depression, anxiety and stress levels were also found to be higher in women. In this context, providing patients with individualized education programs and psychosocial support can have a positive impact on individuals' attitudes to diabetes management.

Ethical approval

The study was approved by İstanbul Medeniyet University Göztepe Training and Research Hospital Clinical Research Ethics Committee (date: 11.10.2023, number: 2023-0690). This study was conducted by the ethical standards outlined in the Declaration of Helsinki and with the approval of the institutional review board. Informed consent was obtained from all patients before their participation.

Author contribution

The authors declare contribution to the paper as follows: Study conception and design: HHM; data collection: MŞ; analysis and interpretation of results: FAE; draft manuscript preparation: MŞ, FAE. All authors reviewed the results and approved the final version of the article.

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Conflict of interest

The authors declare that there is no conflict of interest.

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