

Psychological Insulin Resistance in Type 2 Diabetes Mellitus: Associations with Awareness and Acceptance Levels: A Cross-Sectional Study

Derya BIÇAK AYIK¹ , Derya AKÇA DOĞAN² 

¹Mardin Artuklu University Faculty of Health Sciences, Mardin, Türkiye

²Bursa Uludağ University Faculty of Health Sciences, Bursa, Türkiye

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What is already known on this topic?

- Patient awareness is fundamental for successful management. Individuals who understand their condition are better equipped to take care of themselves.
- Psychological barriers, especially “insulin resistance,” are a significant obstacle to effective treatment. Negative feelings and beliefs about insulin prevent many from achieving good blood sugar control.

What this study adds on this topic?

- This study measured psychological insulin resistance and related mental factors in patients with type 2 diabetes mellitus, going beyond simply acknowledging its existence.
- The study revealed a link between higher insulin resistance and higher diabetes awareness, and it demonstrated that income level, gender, and, crucially, diabetes awareness are significant predictors of this resistance.
- Understanding these factors can lead to better ways to help patients overcome psychological barriers to insulin therapy.

ABSTRACT

Objective: This study investigates the relationship between psychological insulin resistance and diabetes awareness and acceptance among individuals with type 2 diabetes mellitus (T2DM). Additionally, the study seeks to identify factors influencing psychological insulin resistance.

Methods: This cross-sectional study was conducted between July 2023 and March 2024 and included 313 individuals diagnosed with T2DM receiving treatment at a hospital. Data were collected using the Patient Information Form, the Psychological Insulin Resistance (PIR) Scale, and the Diabetes Awareness and Acceptance Scale (DAAS).

Results: The mean total PIR score of the participants was 33.17 ± 10.88 , while the mean total DAAS score was 75.12 ± 16.55 . A statistically significant positive correlation ($r=0.302$, $P < .01$) was found between PIR and DAAS, indicating that individuals with higher diabetes awareness and acceptance also exhibited higher psychological insulin resistance. Regression analysis revealed that income level, gender, diabetes awareness, and disease duration had significant effects on PIR.


Conclusion: This study demonstrates that PIR increases in parallel with diabetes awareness and acceptance, suggesting that individuals who are more aware of and have accepted their condition may still experience psychological barriers toward insulin therapy. Individualized approaches based on income level, gender, awareness, and diabetes duration are critical in addressing resistance to insulin therapy. Psychological support and multidisciplinary educational programs can enhance treatment adherence and improve health outcomes in diabetes management.

Keywords: Acceptance process, awareness, diabetes mellitus, insulin resistance

Introduction

Diabetes is one of the most common chronic diseases worldwide, associated with high rates of disability and mortality. Type 2 diabetes mellitus (T2DM) accounts for approximately 90%-95% of all diabetes cases.^{1,2} Type 2 diabetes mellitus is a global chronic condition requiring ongoing medical care and support programs.³ As a lifestyle-related disease, the primary goal in T2DM management is to halt disease progression and prevent complications. Effective health management, screening, and early intervention are critical to preventing complications and improving quality of life.² However, impaired disease awareness or denial of having diabetes may negatively impact clinical outcomes.¹ To maintain optimal glycemic control, adopting and sustaining health behaviors related to self-care management is essential. When insulin therapy becomes necessary, barriers to treatment adherence can be associated with various factors, such

Corresponding author: Derya Biçak Ayık, e-mail: deryaabck@gmail.com

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as low diabetes awareness, lack of trust and acceptance, or inadequate external support.^{4,6}

Awareness refers to an individual's ability to focus on the present moment, surroundings, and activities. Individuals with higher awareness recognize their internal and external experiences at the moment and accept their circumstances without judgment.⁷ Diabetic individuals aware of their condition are more likely to perceive, accept, and adapt to their disease and are better equipped to manage it.^{1,8} Increasing diabetes awareness in society and identifying the factors influencing diabetes knowledge is crucial in achieving glycemic control, preventing complications, and slowing disease progression.⁹ Individuals with T2DM require diabetes management to regulate their blood glucose levels consistently. Diabetes management entails multifactorial behavioral and pharmacological treatments to prevent or delay complications and maintain quality of life.^{10,11} When behavioral interventions are insufficient, pharmacological treatments are considered. In pharmacological treatment, the early use of sulfonylureas or insulin increases the likelihood of effective glycemic management and significantly reduces the risk of complications.¹⁰ The American Diabetes Association (ADA, ²⁰²²) recommends considering early initiation of insulin therapy if there is evidence of ongoing catabolism (weight loss), symptoms of hyperglycemia, or significantly elevated HbA1c levels (>10%) or blood glucose levels (≥ 300 mg/dL).¹² However, many individuals diagnosed with T2DM experience inadequate glycemic control.³ Psychological insulin resistance (PIR) has been identified as one of the primary causes of inadequate glycemic control.¹³ Psychological insulin resistance refers to the psychological barriers to initiating and sustaining insulin therapy.³ Negative attitudes contributing to PIR include hearing about others' negative experiences with insulin therapy, fear of dependency due to regular injections, lack of time for consistent insulin dosing, and difficulty adhering to the dietary changes required by insulin treatment.¹⁴ The level of psychological resistance to insulin therapy varies significantly between countries but is notably high in many. In a study by Zhang et al³, 82.1% of individuals diagnosed with T2DM exhibited PIR. Similarly, Song et al¹⁵ found that 35.7% of individuals with T2DM who had never used insulin refused insulin therapy. Negative attitudes toward insulin therapy can vary based on individuals' beliefs, values, and demographic characteristics.^{3,14-17}

A literature review reveals no studies examining the relationship between PIR and diabetes awareness and acceptance among individuals with T2DM. This study is expected to contribute to existing literature and guide future research, particularly for individuals diagnosed with T2DM who lack disease awareness, struggle to manage their disease, have misinformation or incomplete knowledge, do not accept their condition, and exhibit psychological resistance to insulin therapy. This study investigates the levels of PIR, diabetes awareness, and acceptance among individuals with T2DM. Additionally, sociodemographic and clinical characteristics such as age, gender, education level, income status, and disease duration are among the main factors influencing diabetes awareness, acceptance, and PIR. These variables were considered in the present study to clarify their effects on insulin resistance.

Methods

This cross-sectional, correlational study was conducted between July 2023 and March 2024 with individuals diagnosed with T2DM receiving treatment in the internal medicine clinics of a hospital in southeastern Türkiye. The study sample was selected using a convenience sampling method from patients who were hospitalized in the internal medicine departments of the hospital and met the inclusion criteria.

The study population consisted of all individuals diagnosed with T2DM treated at the hospital during the specified period. A power analysis was conducted to determine the sample size, with a type I error (α) of 5%, a power of 80% ($1-\beta$), and an effect size of 0.20. Based on the analysis, a minimum of 280 participants was targeted. Data collection was completed with 313 T2DM patients who met the inclusion criteria and agreed to participate in the study.

Inclusion criteria included having a diagnosis of T2DM, being 18 years or older, being able to communicate, agreeing to participate in the study, and completing the data form in full. Exclusion criteria included using insulin and/or injectable antidiabetic drugs, having a history of insulin or injectable antidiabetic drug use, inability to communicate, refusal to participate, and incomplete data forms.

Data Collection Tools

Data were collected through face-to-face interviews using a survey form consisting of the Patient Information Form, the PIR Scale, and the Diabetes Awareness and Acceptance Scale (DAAS).

Patient Information Form

Participants answered demographic questions about their age, gender, marital status, and education level. Additionally, information was collected about their employment status, income level, and physical characteristics. Health-related questions included HbA1c values, duration of diabetes diagnosis, additional chronic diseases, and treatment adherence. Participants were also asked whether they had received diabetes education in the past.

Psychological Insulin Resistance Scale

The scale, developed by Song et al in 2016¹⁸, was validated and adapted into Turkish by İşık et al¹⁹. The scale consists of 12 items rated on a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree) and includes 3 sub-dimensions: supportive factors (4-20 points), psycho-cognitive factors (5-25 points), and physical factors (3-15 points). The total score ranges from 12 to 60 points, with higher scores indicating greater psychological resistance to insulin use. In the original study, the Cronbach's α coefficient of the scale was 0.82,¹⁹ while in the present study, it was found to be 0.92, indicating excellent internal consistency.

Diabetes Awareness and Acceptance Scale

The DAAS was developed and validated by Atik et al²⁰ in 2022. It is a 23-item scale with items rated on a 5-point Likert scale (1 = never, 2 = sometimes, 3 = neutral, 4 = often, 5 = always). All items are positively worded, and no reverse scoring is applied. The total score ranges from 23 to 115 points. The scale consists of 2 subscales: awareness (14-70 points) and acceptance (9-45 points). Higher scores indicate higher levels of awareness and acceptance. Cronbach's α coefficients were reported as 0.96 for the total scale, 0.94 for the awareness subscale, and 0.94 for the acceptance subscale.²⁰ In the present study, Cronbach's α coefficients were found to be 0.93 for the total scale, 0.90 for the awareness subscale, and 0.89 for the acceptance subscale, indicating excellent internal reliability.

Data Collection

Data were collected by the researcher through face-to-face interviews with patients who were hospitalized in the internal medicine wards of the hospital. Before initiating data collection, all participants were informed in detail about the purpose, scope, and procedures of the study, and written informed consent was obtained. The questionnaires were administered in a quiet and comfortable environment in the patients' rooms and were completed within approximately 25-30 minutes. Questions that were not clearly understood by the participants

were clarified objectively without leading or interpretation by the researcher.

Data Analysis

The data were analyzed using SPSS version 28.0 (IBM SPSS Corp.; Armonk, NY, USA). Descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated. The normality of the data distribution was evaluated using the Kolmogorov–Smirnov test. Differences in scale scores across sociodemographic and disease-related variables were examined using Student's *t*-test and ANOVA. Pearson correlation analysis assessed the relationship between PIR and diabetes awareness and acceptance. Stepwise multiple regression analysis was performed to identify factors influencing PIR. A significance level of $P < .05$ was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from Mardin Artuklu University Ethics Committee (Approval No: 2023/6-11; Date: June 8, 2023). Written permission was obtained from the hospital where the study was conducted. Permissions to use the scales were obtained from their respective authors. The survey took approximately 10-15 minutes to complete. Patients were informed about the study and obtained consent before participation. The study was conducted by the Declaration of Helsinki.

Results

The mean age of the participants included in the study was 53.11 ± 14.51 years. Regarding sociodemographic characteristics, approximately 60.7% were female, 81.5% were married, 34.8% were literate, 59.4% were unemployed, 61.3% reported a moderate income level, 51.4% had additional chronic diseases, 61.3% had received diabetes education, and 82.1% stated that they regularly adhered to treatment (Table 1). Additionally, the mean duration of diabetes was 10.15 ± 7.98 years, the body mass index (BMI) was 27.78 ± 5.58 kg/m², and the HbA1c level was $7.8 \pm 4.8\%$ (Table 2).

The total mean score of the PIR for individuals with T2DM was 33.17 ± 10.88 . Psychological insulin resistance was associated with age, gender, education level, income level, additional chronic disease, and treatment adherence. Older patients and those with a longer duration of diabetes had lower PIR, while male patients, university graduates, those with a good income level, those without additional chronic diseases, and those adhering to treatment exhibited higher PIR ($P < .01$) (Table 1). Psychological insulin resistance was not associated with BMI or HbA1c values ($P > .05$) (Table 2).

The total mean score of the DAAS was 75.12 ± 16.55 . Diabetes awareness and acceptance were associated with age, education level, employment status, income level, additional chronic disease, diabetes education, and treatment adherence. Individuals with higher education levels, those who were employed, those with a good income level, those without additional chronic diseases, those who had received diabetes education, and those adhering to treatment had higher diabetes awareness and acceptance ($P < .01$) (Table 1). Diabetes awareness and acceptance were not associated with BMI or HbA1c values ($P > .05$). Older age and longer disease duration were associated with lower diabetes awareness and acceptance scores ($P < .05$) (Table 2).

Table 3 shows the scores of the PIR and DAAS, including their subscales and the correlations between them. A statistically significant positive correlation ($r = 0.30$, $P < .01$) was found between PIR and diabetes awareness and acceptance, indicating that individuals with higher awareness and acceptance also exhibited higher PIR (Table 3).

Table 1. Basic Information about the Participants

Variables	N (%)	PIR		DAAS	
		Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD
Gender					
Female	190 (60.7)	30.73 \pm 9.94	74.22 \pm 16.66		
Male	123 (39.3)	36.94 \pm 11.23	76.51 \pm 16.36		
Statistical analysis		$t = -5.122$ $P = .000^{**}$	$t = -1.196$ $P = .232$		
Marital status					
Married	255 (81.5)	33.32 \pm 10.62	74.85 \pm 16.41		
Single	58 (18.5)	32.51 \pm 12.04	76.29 \pm 17.26		
Statistical analysis		$t = 0.510$ $P = .611$	$t = -0.596$ $P = .551$		
Education level					
Literate	109 (34.8)	29.55 \pm 9.74	70.55 \pm 14.84		
Primary school graduate	79 (25.2)	33.08 \pm 9.44	72.30 \pm 17.33		
Secondary school/high school graduate	62 (19.8)	33.93 \pm 10.86	78.72 \pm 15.99		
University graduate/postgraduate	63 (20.1)	38.80 \pm 12.10	83.01 \pm 15.59		
Statistical analysis		$F = 10.663$ $P = .000^{**}$	$F = 10.094$ $P = .000^{**}$		
Employment status					
Yes	127 (40.6)	34.81 \pm 11.85	78.37 \pm 18.26		
No	186 (59.4)	32.05 \pm 10.05	72.90 \pm 14.93		
Statistical analysis		$t = 2.210$ $P = .028$	$t = 2.902$ $P = .004^*$		
Income level					
Poor	87 (27.8)	26.57 \pm 9.60	68.14 \pm 16.43		
Moderate	192 (61.3)	35.17 \pm 9.78	76.84 \pm 15.43		
Good	34 (10.9)	38.76 \pm 12.46	83.20 \pm 17.21		
Statistical analysis		$F = 27.795$ $P = .000^{**}$	$F = 13.863$ $P = .000^{**}$		
Additional chronic disease					
Yes	161 (51.4)	31.24 \pm 10.96	72.57 \pm 16.84		
No	152 (48.6)	35.21 \pm 10.42	77.81 \pm 15.86		
Statistical analysis		$t = -3.273$ $P = .001^*$	$t = -2.828$ $P = .005^*$		
Regular treatment adherence					
Yes	257 (82.1)	34.17 \pm 10.87	76.89 \pm 16.29		
No	56 (17.9)	28.60 \pm 9.80	66.98 \pm 15.39		
Statistical analysis		$t = 3.529$ $P = .000^{**}$	$t = 4.164$ $P = .000^{**}$		
Diabetes education					
Yes	192 (61.3)	34.19 \pm 11.46	78.15 \pm 16.50		
No	121 (38.7)	31.56 \pm 9.73	70.30 \pm 15.53		
Statistical analysis		$t = 2.093$ $P = .037$	$t = 4.191$ $P = .000^{**}$		

* $P < .05$.

** $P < .01$.

DAAS, Diabetes Awareness and Acceptance Scale; PIR, Psychological Insulin Resistance Scale.

Table 4 presents the stepwise multiple regression analysis results of factors affecting PIR in individuals with T2DM. Income level, gender, diabetes awareness, and duration of diabetes were found to have significant effects on PIR. Income level alone accounted for 14.1% ($R^2 = 0.141$) of the variance in PIR. When gender was added, the explanatory power increased to 20.4% ($R^2 = 0.204$). Adding diabetes awareness increased the explanatory power to 25.0% ($R^2 = 0.250$), and adding the duration of diabetes raised it to 27.0% ($R^2 = 0.270$). The overall model was statistically significant ($R = 0.520$, $R^2 = 0.270$, $F = 28.536$, $P < .001$),

Table 2. Factors Associated with Psychological Insulin Resistance, Diabetes Awareness, and Acceptance

Variables	Mean ± SD	PIR		DAAS	
		r	P	r	P
Age	53.11 ± 14.51	-0.176**	.002	-0.166**	.003
BMI	27.78 ± 5.58 kg/m ²	0.019	.732	-0.053	.354
Diabetes duration	10.15 ± 7.98	-0.246**	.000	-0.122*	.031
HbA1c	7.8 ± 4.8	-0.026	.644	-0.022	.696

*P < .05.

**P < .01.

BMI, body mass index; DAAS, Diabetes Awareness and Acceptance Scale; PIR, Psychological Insulin Resistance Scale.

indicating that these independent variables together explained 27.0% of the total variance in PIR.

Discussion

This study investigated the relationship between PIR and diabetes awareness and acceptance in individuals with T2DM. The mean PIR score of the participants was found to be 33.17 ± 10.88. A high score on the scale indicates a greater psychological resistance to insulin use. Considering the scale's minimum score of 12 and maximum score of 60, it can be stated that the participants' PIR was moderate. This study found that age, gender, education level, income level, additional chronic disease, and treatment adherence were associated with PIR.

It was determined that males with T2DM exhibited higher PIR than females. Previous studies have supported the potential relationship between gender and refusal of insulin therapy. Similarly, a study found that PIR was higher in males, and the difference was statistically significant.¹⁵ Another study reported that males exhibited higher PIR than females, although the difference was not statistically significant.¹⁴ In contrast, other studies have shown that females exhibit greater PIR than males.^{3,16} The discrepancies in results may be due to socio-cultural differences between countries and demographic variations (e.g., gender ratio and diabetes duration) in study samples. In the present study, this difference may also be related to gender norms and health-seeking behaviors specific to Turkish culture, where male patients may perceive insulin dependence as a loss of autonomy.

This study found a significant negative correlation between age and PIR. It was observed that PIR decreased with increasing age. In the literature, age has not been consistently identified as a determinant of PIR, and study results vary. Rita et al¹⁶ reported that PIR was more prevalent in individuals under 50. Another study found that younger patients exhibited higher insulin refusal, but the difference was not statistically significant.¹⁵ Other studies found no significant relationship between age and PIR.^{3,15,17} This inconsistency across studies may

Table 4. Stepwise Regression Analysis of Factors Influencing PIR

PIR	β	Beta	R	R ²	P
Income level	4.826	0.266	0.376	0.141	.000
Gender	5.501	0.247	0.452	0.204	.000
Diabetes awareness	0.230	0.219	0.500	0.250	.000
Diabetes duration	-0.203	-0.146	0.520	0.270	.004

PIR, Psychological Insulin Resistance Scale.

be related to differences in sample composition, cultural attitudes toward aging and chronic illness, and variations in the measurement of PIR. Younger individuals may perceive insulin therapy as a sign of disease progression or personal failure, which can lead to greater emotional resistance. Older adults, having lived longer with the disease, may develop a more accepting attitude toward treatment. Therefore, increasing age may be associated with a tendency toward reduced negative emotions and misconceptions about insulin therapy.

In this study, individuals with higher education and income levels demonstrated greater PIR. Contrary to this finding, a study reported that individuals with higher monthly income had lower PIR.³ In the same study, no significant relationship was found between education level and PIR; however, illiterate individuals had higher levels of PIR.³ Other studies have reported no relationship between PIR and education level^{14,15} or income level.^{15,17} This inconsistency may be related to differences in health literacy, social status, and perceived self-efficacy. In this sample, individuals with higher education or income may have been more confident in self-management and therefore more reluctant to initiate insulin therapy.

A significant negative correlation was found between the duration of diabetes and PIR in this study. Consistent with this finding, another study found a significant correlation between disease duration and PIR, with higher resistance in groups with shorter disease durations.³ Similarly, another study associated longer diabetes duration with lower insulin refusal.¹⁴ As the disease duration increases, patients may acquire more comprehensive knowledge about the disease and insulin due to prolonged treatment, leading to lower resistance.

In this study, the mean total score for the DAAS was 75.12 ± 16.55, indicating a level above average. Similar to the findings of this study, another study reported that diabetes awareness and acceptance levels were above average.²¹ Studies investigating disease acceptance in diabetic patients found moderate levels of disease acceptance.^{22,23} In contrast, a different study reported that most participants had low levels of disease acceptance.²⁴ Variations in study results are thought to be influenced by cultural, regional, and individual differences. Additionally, 61.3% of patients in this study received diabetes education, which may have positively affected diabetes awareness and acceptance.

Table 3. Correlations Between PIR and DAAS Subscales

Scales	Mean ± SD	DAAS					
		Awareness		Acceptance		Total DAAS	
PIR		r	p	r	p	r	p
Supportive factors	11.47 ± 4.03	0.239**	.000	0.152**	.007	0.218**	.000
Psycho-cognitive factors	13.55 ± 4.78	0.327**	.000	0.341**	.000	0.358**	.000
Physical factors	8.14 ± 3.66	0.194**	.001	0.152**	.007	0.190**	.001
Total PIR	33.17 ± 10.88	0.297**	.000	0.257**	.000	0.302**	.000

*P < .05.

**P < .01.

DAAS, Diabetes Awareness and Acceptance Scale; PIR, Psychological Insulin Resistance Scale.

This study found a negative correlation between diabetes awareness, acceptance, and age and diabetes duration. Sendur and Adas reported that awareness and knowledge levels decrease with age.⁹ Özkaptan et al²⁴ found a negative relationship between disease acceptance and age but no relationship between disease acceptance and duration. A study conducted in Türkiye reported no relationship between diabetes awareness and acceptance and age or disease duration.²⁵

In this study, diabetes awareness and acceptance were higher in individuals with higher education levels, those who were employed, those with good income levels, those who had received diabetes education, and those who adhered to treatment. The results align with findings showing that individuals with higher education levels have higher acceptance^{21,22,24} and awareness rates.^{9,21,26} Evidence suggests that diabetes awareness significantly increases with education and academic levels, as individuals with higher education are more likely to acquire knowledge about diabetes and adopt healthier practices. Regarding income level, studies have reported a positive correlation between income and diabetes acceptance and awareness.^{9,21,27,28} This study found that individuals with lower income levels had significantly lower diabetes awareness and acceptance. These findings suggest that individual sociodemographic characteristics—particularly education, income, and access to diabetes education—should be carefully considered when designing programs aimed at improving awareness and acceptance among individuals with diabetes.

The results of this study demonstrated a statistically significant positive correlation between diabetes awareness–acceptance and PIR ($r = 0.302$, $P < .01$). In other words, individuals with higher diabetes awareness and acceptance also exhibited higher PIR. This finding contrasts with the assumption that increased awareness necessarily reduces psychological barriers. This positive association may reflect that individuals who are more aware of their disease are also more conscious of the challenges, possible side effects, or social and emotional implications of insulin therapy, which may lead to heightened hesitation despite greater understanding. Additionally, diabetes awareness, income level, gender, and diabetes duration were found to significantly influence PIR. To the best of knowledge, no previous studies have examined the relationship between PIR and diabetes awareness and acceptance in individuals with T2DM.

The findings of this study highlight the importance of considering factors such as income level, gender, diabetes awareness, and disease duration when understanding and managing PIR in individuals with T2DM. Evaluating PIR from the time of diagnosis and implementing strategies to reduce it are critical. During this process, providing psychosocial support tailored to individuals' needs and fostering strong collaboration with the healthcare team can improve treatment adherence and contribute to improved glycemic control and long-term health outcomes.

Conclusion

This study contributes to understanding the factors influencing PIR in individuals with T2DM. The findings highlight that income level, gender, diabetes awareness, and diabetes duration are significant determinants of PIR. These results emphasize the importance of individualized approaches in diabetes management. Addressing socioeconomic and demographic factors and recognizing the psychological barriers that may accompany awareness and acceptance are critical in combating resistance to insulin therapy. Implementing tailored education and support programs in primary healthcare settings can help reduce PIR. Overall, multidisciplinary approaches that enhance diabetes awareness while addressing emotional adaptation and disease acceptance are likely to enhance treatment adherence and improve long-term health outcomes.

Limitations

This study has some limitations. Its cross-sectional design prevents causal inference. The convenience sample from a single hospital limits generalizability to all individuals with diabetes. Self-reported data may also introduce bias. Moreover, factors such as stigma, depression, and social support were not assessed, which could further explain variations in PIR. Future multi-center and longitudinal studies are recommended to address these limitations.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethical approval was obtained from the Mardin Artuklu University Non-Interventional Clinical Research Ethics Committee (Approval No: 2023/6-11; Approval Date: June 8, 2023). Written permission was obtained from the hospital where the study was conducted. Permissions to use the scales were obtained from their respective authors.

Informed Consent: Written informed consent was obtained from participants who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – D.B.A., D.A.D.; Design – D.B.A., D.A.D.; Supervision – D.B.A., D.A.D.; Resources – D.B.A., D.A.D.; Materials – D.B.A., D.A.D.; Data Collection and/or Processing – D.B.A.; Analysis and/or Interpretation – D.B.A., D.A.D.; Literature Search – D.B.A., D.A.D.; Writing Manuscript – D.B.A., D.A.D.; Critical Review – D.B.A., D.A.D.

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