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Association Between Diabetes-Related Stigma and Treatment Adherence in Adults with Type 2 Diabetes Mellitus: A Cross-Sectional Study

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Abstract

Background

Treatment adherence is a key issue in type 2 diabetes mellitus and may be influenced by diabetes-related stigma, but evidence on this relationship is limited.

Objectives

To explore the relationship between diabetes-related stigma and treatment adherence among adults with Type 2 Diabetes Mellitus

Methods

This cross-sectional study was conducted at the endocrinology clinic of a publicly funded hospital in Turkey from June 2023 to February 2024. A total of 308 adults with T2DM were recruited through convenience sampling. Data were collected using a sociodemographic and clinical characteristics form, the Type 2 Diabetes Stigma Assessment Scale, and the Type 2 Diabetes Mellitus Treatment Patient Compliance Scale. Hierarchical multiple linear regression analyses were conducted to identify predictors of treatment adherence.

Results

The mean stigma total score was 46.31 ± 12.35, and the mean treatment adherence score was 72.44 ± 12.11. Total diabetes stigma was significantly positively correlated with treatment adherence score ($r = 0.193$, $p < 0.001$). In the final regression model, total stigma was a significant predictor of treatment adherence ($\beta = 0.144$, $p = 0.017$), together with self-care ability and alcohol consumption, explaining 12.1% of the variance. Higher stigma scores were associated with poorer treatment adherence.

Conclusion

Diabetes-related stigma is significantly associated with poorer treatment adherence in adults with type 2 diabetes mellitus. Total stigma emerged as a significant predictor of treatment adherence in the multivariate model, alongside self-care ability and alcohol consumption. These findings highlight the importance of addressing psychosocial factors in diabetes management to improve adherence outcomes.

Key Points

• Diabetes-related stigma is significantly associated with poorer treatment adherence in adults with type 2 diabetes mellitus.

• Higher self-care ability (independent status) and alcohol consumption are significant predictors of treatment adherence alongside stigma.

• Addressing psychosocial factors, particularly diabetes-related stigma, may improve adherence outcomes in clinical diabetes care.

1. INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease characterized by impaired glucose regulation and represents a significant global public health challenge (Ahmad et al., 2022). The International Diabetes Foundation's 2025 report states that in 2024, 588.7 million people had diabetes, with T2DM being the most common, accounting for over 90% of cases worldwide (Magliano et al., 2025). Alarmingly, the global prevalence of diabetes is expected to reach 852.5 million by 2050, highlighting the urgent need for effective long-term disease management strategies. Effective management of T2DM largely depends on patients adhering to prescribed treatment plans, which include medication, dietary guidelines, exercise, and consistent blood glucose monitoring (Aminuddin et al., 2021; García-Molina et al., 2020). Despite improvements in treatment, non-adherence continues to be a widespread issue that results in poor glycemic control, higher complication rates, hospital admissions, and increased mortality (Schlesinger et al., 2020).

Treatment adherence is essential for effective T2DM management, playing a critical role in achieving optimal glycemic control and reducing the risk of long-term complications, morbidity, and mortality (García-Molina et al., 2020). Despite substantial advances in pharmacological and non-pharmacological diabetes management, non-adherence to treatment remains a widespread and persistent problem among adults with T2DM (Schlesinger et al., 2020). Recent meta-analyses show that non-adherence to medications, dietary advice, physical activity, and healthy lifestyle behaviors ranges from 41.05% to 50.59%, emphasizing the scale and importance of this ongoing challenge (Abate et al., 2024; Azharuddin et al., 2021; Piragine et al., 2023). Given the high prevalence of non-adherence, treatment adherence in T2DM is affected by a complex interaction of individual, clinical, and psychosocial factors (Schlesinger et al., 2020). While traditional barriers such as treatment complexity, comorbidities, and socioeconomic constraints are well documented, recent attention has increasingly focused on stigma as a significant psychosocial barrier to effective chronic disease self-management (Rai et al., 2020). Stigmatization may occur through negative attitudes, judgment, or discriminatory behaviors directed toward individuals, as well as through excessive sympathy or moral blame. It can occur at structural levels, such as discriminatory policies, or at the individual level through internalized or self-stigma (Akyirem et al., 2023; Basinger et al., 2020).

Emerging evidence indicates that stigmatization goes beyond causing psychosocial distress and has real effects on healthcare engagement. Stigmatization has been shown to reduce access to healthcare,

restrict individuals' autonomy in making treatment decisions, and, in some cases, lead to coerced or less effective care (Sedaei et al., 2025). Moreover, individuals facing stigma may hide their diagnosis, postpone seeking medical care, or withdraw from health services, leading to worsening symptoms and early discontinuation of treatment (Akyirem et al., 2023; Schabert et al., 2013). In the context of diabetes, stigma encompasses both external discrimination and internal feelings of shame, guilt, or self-blame related to the disease (Persky et al., 2024).

Previous qualitative and quantitative studies have emphasized the psychosocial burden of living with diabetes; however, relatively few have quantitatively examined the direct relationship between diabetes-related stigma and treatment adherence using validated, multidimensional measurement tools. Moreover, evidence remains limited on how different dimensions of stigma specifically influence various aspects of adherence, including emotional, physical, behavioral, and cognitive domains (İşleyen & Özdemir, 2024; Li et al., 2023; Sedaei et al., 2025). Also, controlling for factors such as self-care ability, lifestyle, and clinical parameters is essential to fully understand these complex relationships. However, there is limited evidence examining the independent effect of diabetes-related stigma on treatment adherence using hierarchical regression models that account for key sociodemographic and clinical covariates. It is stated that evaluating patients in terms of stigma can provide nurses with a new perspective on interventions to support their patients' lives. This gap in the literature limits the development of comprehensive, stigma-informed interventions aimed at improving adherence in adults with T2DM.

Addressing this gap is especially crucial for clinical practice. A better understanding of how stigma affects poor treatment adherence is vital to developing interventions that target the behavioral, emotional, and social factors that influence self-management (Kato et al., 2020). Since nurses play a key role in diabetes care, they are well-positioned to recognize stigma-related barriers, promote self-management, and apply care strategies that are sensitive to stigma. Increasing nurses' awareness of T2DM-related stigma and its effects on adherence may ultimately contribute to improved treatment outcomes and more comprehensive diabetes management. This study aimed to examine the association between diabetes-related stigma and treatment adherence in adults with T2DM and to determine the extent to which stigma predicts treatment adherence after controlling for sociodemographic and clinical factors. This study attempted to answer the following questions:

1. What are the levels of perceived and experienced diabetes-related stigma and treatment adherence among adults with T2DM?
2. Is diabetes-related stigma associated with treatment adherence in adults with T2DM?
3. How does diabetes-related stigma predict treatment adherence in adults with type 2 diabetes mellitus after controlling for relevant sociodemographic and clinical factors?

2. METHODS

2.1. Study Design and Participants

This is a cross-sectional study. The study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies (von Elm et al., 2014). The study employed a convenience sampling method to recruit adults diagnosed with T2DM who were enrolled in the endocrinology clinic of a publicly funded hospital in a province in Turkey between June 2023 and February 2024. A priori sample size calculation was performed using G*Power software (Faul et al., 2009). For multiple linear regression analysis (fixed model, R^2 deviation from zero), with a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and power $(1 - \beta) = 0.80$, the minimum required sample size was estimated at 77 participants. During the study period, 308 eligible participants were recruited and included in the final analysis, exceeding the minimum required sample size and ensuring adequate statistical power.

2.2. Inclusion and Exclusion Criteria

Participants were included or excluded based on the established inclusion and exclusion criteria. Inclusion criteria were: (a) aged 18 years or older; (b) diagnosed with T2DM for at least one year; (c) using oral antidiabetic agents and/or insulin; (d) without communication problems; (e) volunteering to participate in this study. Exclusion criteria were: (a) had cognitive disorders; (b) had a diagnosis of neurological or psychiatric disease.

2.3. Variables

The variables in this study were the following:

- Predictor variables: Total T2DM stigma assessment score
- Outcome variables: Total T2DM treatment patient compliance score
- Covariates included sociodemographic and clinical variables (age, gender, marital status, education level, income level, employment status, BMI, duration of diabetes, type of treatment, and self-care ability).

2.4. Data Collection Tools

2.4.1. Sociodemographic and Clinical Characteristics Form

This questionnaire was created based on a review of the relevant literature by the researchers (İşleyen & Özdemir, 2024; Kato et al., 2020; Sedaei et al., 2025). Sociodemographic questions consist of age, gender, marital status, educational status, employment status, and income level. Clinical questions include duration and treatment of T2DM, BMI, comorbid diseases, and alcohol and smoking consumption. BMI was calculated as weight in kilograms divided by height in centimetres squared. A BMI of less than 18.5 kg/m^2 was considered underweight, between 18.5–24.9 kg/m^2 as a healthy weight, between 25.0-29.9 kg/m^2 as overweight, and 30 kg/m^2 or more as obese (Centers for Disease Control and Prevention, 2022).

2.4.2. Type 2 Diabetes Stigma Assessment Scale

This scale was used to evaluate perceived and experienced T2DM stigma. Browne et al. developed the scale in 2016, and Inkaya and Karadag evaluated the Turkish version in 2021 (Browne et al., 2016; İnkaya & Karadağ, 2021). The scale consists of 19 items on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). It includes three sub-dimensions: treated differently (items 1, 4, 7, 10, 14, 17), blame and judgement (items 2, 3, 5, 8, 12, 16, 19), and self-stigma (items 6, 9, 11, 13, 15, 18). Scores range from 19 to 95 for the total scale, 6 to 30 for the treated differently and self-stigma sub-dimensions, and 7 to 35 for the blame and judgment sub-dimension. Higher scores indicate higher perceived diabetes stigma (Browne et al., 2016). The Cronbach's alpha reliability coefficient was 0.95 for the total scale in the developed study and 0.92 in the Turkish validity and reliability assessment (Browne et al., 2016; İnkaya & Karadağ, 2021). In the present study, Cronbach's alpha coefficients were 0.73 for treated differently, 0.68 for blame and judgment, 0.84 for self-stigma, and 0.88 for the total scale. The internal consistency of the scale was also evaluated using McDonald's omega. The total omega coefficient was 0.92, indicating excellent reliability. The hierarchical omega coefficient was 0.61, suggesting a moderate general factor structure. For the subscales, omega values indicated good to excellent reliability, with 0.84 for treated differently, 0.80 for blame and judgment, and 0.95 for self-stigma.

2.4.3. Type 2 Diabetes Mellitus Treatment Patient Compliance Scale

This scale was used to evaluate treatment adherencefor T2DM in adults. Demirtas and Akbayrak developed the scale in 2017 (Demirtaş & Akbayrak, 2017). The scale consists of a five-point Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree) and a total of 30 items, 13 positive and 17 negatives (items 2, 4, 6, 7, 9, 10, 11, 12, 14, 18, 20, 21, 22, 24, 27, 28, 30). The negative items score from 5 to 1. It includes seven sub-dimensions: emotional difficulties (items 11, 12, 14, 20, 22, 23, 28, 29), physical difficulties (items 3, 7, 8, 13, 16, 26), changing difficulties of habits (items 5, 19, 27), acceptance difficulties (items 10, 18, 21), awareness difficulties (items 1, 15, 17, 25), diet difficulties (items 6, 24, 30) and denial difficulties (items 2, 4, 9). The total score ranges from 30 to 150, with lower scores indicating better adherence. In the developed study, the Cronbach's alpha reliability coefficient of the scale was 0.77 (Demirtaş & Akbayrak, 2017). In the present study, Cronbach's alpha was 0.73 for the total scale, while subscale values ranged from 0.51 to 0.69, indicating low to moderate internal consistency. Internal consistency was also evaluated using McDonald's omega. The total omega coefficient was 0.80, indicating good reliability. However, some subscales showed lower reliability, with omega values ranging from 0.31 to 0.79.

2.5. Data Collection

The data were collected between June 2023 and February 2024 in the endocrinology clinic of a public hospital in a province in Turkey. Data was collected using the Sociodemographic and Clinical Questionnaire, the Type 2 Diabetes Stigma Assessment Scale, and the Type 2 Diabetes Mellitus Treatment Patient Compliance Scale. The researcher collected the data through face-to-face interviews, which took approximately 30 minutes to complete. Before the study began, participants were informed of the study's purpose, and their consent was obtained both in writing and verbally.

2.6. Data Analysis

The data were analyzed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA) and R statistical software (R Foundation for Statistical Computing, Vienna, Austria). Data distribution was assessed using skewness and kurtosis, with visual inspection of histograms and Q–Q plots. Continuous variables were presented as means and standard deviations, and categorical variables were summarized as frequencies and percentages. Internal consistency reliability of the scales was assessed using Cronbach's alpha and McDonald's omega. Cronbach's alpha was calculated in SPSS, while McDonald's omega was computed in R. This dual approach was used to provide a more robust estimate of internal consistency reliability. Covariates were selected a priori based on prior literature and clinical relevance. Preliminary analyses were also conducted using Pearson correlation for continuous variables and independent-samples t-tests or one-way ANOVA for categorical variables to inform covariate selection (Karagöz et al., 2025; Yildirim et al., 2024; Yuceer & Cinar, 2025). Full results are presented in Supplementary Table S2. Hierarchical multiple linear regression was used to examine predictors of treatment adherence. In Model 1, sociodemographic and clinical variables (age, gender, duration of diabetes, and treatment type) were entered. In Model 2, additional covariates identified in preliminary analyses (living status, self-care ability, and alcohol consumption) were included. In Model 3, the total diabetes stigma score was added to assess its incremental explanatory contribution beyond sociodemographic and clinical variables. Multicollinearity was assessed using variance inflation factor (VIF) values. A VIF value < 10 was considered acceptable, indicating no evidence of multicollinearity, and no variables were excluded based on this criterion (Pallant, 2020). All statistical analyses were two-tailed, and a p-value < 0.05 was considered statistically significant.

2.7. Ethical Considerations

The study followed the Declaration of Helsinki and a local hospital's Institutional Review Board approved this study (Protocol No: 2023/348 – approval date: 22 May 2023 / approval no: E-76261397-050.99-352355). Before the study began, participants were informed of the study's purpose and procedure. They were also informed that they could withdraw from the study at any time without any negative consequences. Verbal and written informed consent were obtained from all participants.

3. RESULTS

3.1. Participants' Sociodemographic and Clinical Characteristics

A total of 428 individuals were assessed for eligibility, of whom 100 had a T2DM diagnosis of less than one year, and 20 refused to participate. The final response rate was 71.96%. Table 1 presents the sociodemographic and clinical characteristics of the participants. The mean age was 62.33 years; 53.6% were female, 82.5% were married, and 67.2% had completed primary school. In addition, 42.9% reported income higher than expenditure, 79.5% were unemployed, and 95.1% lived with family or others. Most participants (76.0%) were independent in self-care, and 35.4% were classified as obese. Regarding

clinical characteristics, 69.5% had T2DM for 10 years or more, and 44.2% were receiving both oral antidiabetics and insulin therapy. The majority were non-smokers (77.6%) and non-alcohol users (88.6%). Additionally, 79.2% of participants had at least one comorbid condition, including hypertension, cardiovascular disease, or chronic kidney disease (Table 1).

Table 1
Participants' Sociodemographic and Clinical Characteristics (n = 308)

Variables	**n**	**%**
Age (years) Mean ± SD	62.33 ± 12.77	
Gender		
Female	165	53.6
Male	143	46.4
Marital status		
Married	254	82.5
Single	54	17.5
Educational status		
Literate	40	13.0
Primary school	207	67.2
Secondary school	38	12.3
University/Postgraduate	23	7.5
Income level		
Income lower than expenses	99	32.1
Income equal to expenses	77	25.0
Income higher than expenses	132	42.9
Employment status		
Employed	63	20.5
Not employed	245	79.5
Living status		
Alone	15	4.9
With family/others	293	95.1
BMI		
Underweight (< 18.5 kg/m^2)	8	2.6
Normal weight (18.5–24.9 kg/m^2)	86	27.9
Overweight (25.0-29.9 kg/m^2)	105	34.1

Variables	n	%
Obese (≥ 30 kg/m^2)	109	35.4
T2DM duration		
1–5 years	49	15.9
6–9 years	45	14.6
10 years and over	214	69.5
T2DM treatment		
Oral antidiabetics	90	29.2
Insulin	82	26.6
Oral antidiabetics + Insulin	136	44.2
Self-care ability		
Independent	234	76.0
Partially dependent	74	24.0
Smoke consumption		
Yes	69	22.4
No	239	77.6
Alcohol consumption		
Yes	35	11.4
No	273	88.6
Comorbidity		
No comorbidity	64	20.8
At least one comorbidity	244	79.2

Bivariate analyses were conducted using t-tests, ANOVA, and Pearson correlation to examine relationships between sociodemographic and clinical variables and treatment adherence. Significant variables, along with those supported by previous literature, were included in the hierarchical regression models. Detailed results are provided in Supplementary Table S2.

3.2. Scores of Diabetes Stigma and Treatment Adherence

Table 2 presents mean scores for diabetes stigma and treatment adherence. The mean total Type 2 Diabetes Stigma Assessment Scale score was 46.31 ± 12.35. Among subdimensions, the highest score was for blame and judgment (19.94 ± 4.68), followed by self-stigma (14.29 ± 5.86) and treated differently

(12.07 ± 3.65). The mean total Type 2 Diabetes Mellitus Treatment Patient Compliance Scale was 72.44 ± 12.11. Among subdimensions, emotional difficulties had the highest mean score (19.05 ± 5.20), while denial difficulties had the lowest (7.11 ± 2.14) (Table 2).

Table 2
Mean Scores of Diabetes Stigma and Treatment Adherence (n = 308)

Variables	Mean ± SD
Type 2 Diabetes Stigma Assessment Scale	
Treated differently	12.07 ± 3.65
Blame and judgment	19.94 ± 4.68
Self-stigma	14.29 ± 5.86
Total score	46.31 ± 12.35
Type 2 Diabetes Mellitus Treatment Patient Compliance Scale	
Emotional difficulties	19.05 ± 5.20
Physical difficulties	13.34 ± 3.58
Changing difficulties of habits	9.71 ± 2.79
Acceptance difficulties	7.76 ± 2.01
Awareness difficulties	7.22 ± 3.61
Diet difficulties	8.23 ± 2.12
Denial difficulties	7.11 ± 2.14
Total score	72.44 ± 12.11

3.3. Correlation Between Diabetes Stigma and Treatment Adherence

Table 3 presents correlations between diabetes stigma and treatment adherence. All diabetes stigma dimensions were significantly and positively correlated with treatment adherence scores, indicating that higher stigma was associated with lower adherence. Specifically, treated differently ($r = 0.145$, $p = 0.011$), blame and judgment ($r = 0.191$, $p < 0.001$), self-stigma ($r = 0.163$, $p = 0.004$), and total stigma score ($r = 0.193$, $p < 0.001$) were positively associated with treatment adherence scores.

Table 3
Correlations Between Diabetes Stigma and Treatment Adherence (n = 308)

Variables	r	p
Treated differently	0.145	0.011
Blame and judgment	0.191	< .001
Self-stigma	0.163	0.004
Total stigma score	0.193	< .001
Note. r = Pearson correlation coefficient; p = significance level		

3.4. Hierarchical Multiple Regression Analysis Predicting Treatment Adherence

Table 4 presents results from a hierarchical multiple regression analysis identifying predictors of treatment adherence. In model 1, sociodemographic and clinical variables (age, gender, diabetes duration, and treatment type) were included. The model was not statistically significant and explained 2.0% of the variance in treatment adherence ($R^2 = 0.020$, $p = 0.397$). None of the variables were significant predictors. In model 2, self-care ability, alcohol consumption, and living status were added. The model was statistically significant and explained 10.4% of the variance in treatment adherence ($R^2 = 0.104$, $p < 0.001$). Self-care ability ($\beta = -0.206$, $p < 0.001$) and alcohol consumption ($\beta = 0.196$, $p = 0.001$) were significant predictors, whereas living status was not statistically significant. In model 3, total diabetes stigma was added. The model remained statistically significant and explained 12.1% of the variance in treatment adherence ($R^2 = 0.121$, $p = 0.017$ for stigma). Total diabetes stigma was a significant positive predictor of treatment adherence score ($\beta = 0.144$, $p = 0.017$), indicating that higher stigma was associated with lower adherence. Self-care ability ($\beta = -0.173$, $p = 0.003$) and alcohol consumption ($\beta = 0.201$, $p = 0.001$) also remained significant predictors in the final model. No multicollinearity was detected among variables (VIF < 10) (Table 4).

Table 4
Hierarchical Multiple Regression Analysis Predicting Treatment Adherence (n = 308)

Predictor	B	SE	β	t	p	95% CI [Lower, Upper]	VIF
Model 1							
Constant	70.348	4.156		16.92	< .001	[62.169, 78.528]	
Age	0.040	0.057	0.042	0.70	.483	[-0.072, 0.151]	1.10
Gender (1 = female)	-2.483	1.392	-0.102	-1.78	.075	[-5.221, 0.256]	1.01
Duration 6–9 years	3.110	2.511	0.091	1.24	.217	[-1.832, 8.052]	1.65
Duration ≥ 10 years	0.549	1.991	0.021	0.28	.783	[-3.368, 4.466]	1.77
Treatment: insulin	-0.710	1.971	-0.026	-0.36	.719	[-4.588, 3.169]	1.59
Treatment: oral antidiabetics + insulin	0.672	1.723	0.028	0.39	.697	[-2.718, 4.063]	1.54
Model summary	$R = 0.143$, $R^2 = 0.020$, Adj.$R^2 = 0.001$, F change (6, 301) = 1.044, p = 0.397						
Model 2							
Constant	69.177	5.463		12.66	< .001	[58.426, 79.928]	
Age	0.039	0.056	0.041	0.70	.487	-0.072, 0.150	1.18
Gender (1 = female)	-0.509	1.409	-0.021	-0.36	.718	-3.282, 2.265	1.12
Duration 6–9 years	1.881	2.426	0.055	0.78	.439	-2.894, 6.656	1.67
Duration ≥ 10 years	0.134	1.917	0.005	0.07	.944	-3.638, 3.906	1.77
Treatment: insulin	-0.955	1.916	-0.035	-0.50	.619	-4.726, 2.816	1.63
Treatment: oral antidiabetics + insulin	-0.654	1.689	-0.027	-0.39	.699	-3.977, 2.669	1.60
Living together (1 = yes)	5.104	3.137	0.091	1.63	.105	-1.070, 11.278	1.04
Self-care (1 = independent)	-5.833	1.624	-0.206	-3.59	< .001***	-9.029, -2.637	1.10
Alcohol use (1 = yes)	7.458	2.229	0.196	3.35	.001**	3.071, 11.845	1.14
Model summary	$R = 0.323$, $R^2 = 0.104$, Adj.$R^2 = 0.077$, F change (3, 298) = 9.309, p < 0.001						
Model 3							

Predictor	B	SE	β	t	p	95% CI [Lower, Upper]	VIF
Model 1							
Constant	64.399	5.775		11.15	< .001	[53.034, 75.764]	
Age	0.026	0.056	0.027	0.46	.645	-0.085, 0.136	1.19
Gender (1 = female)	-0.098	1.409	-0.004	-0.07	.944	-2.871, 2.674	1.14
Duration 6–9 years	1.735	2.408	0.051	0.72	.472	-3.003, 6.474	1.67
Duration ≥ 10 years	-0.445	1.917	-0.017	-0.23	.817	-4.217, 3.328	1.80
Treatment: insulin	-1.527	1.916	-0.056	-0.80	.426	-5.297, 2.243	1.66
Treatment: oral + insulin	-0.946	1.680	-0.039	-0.56	.574	-4.251, 2.360	1.61
Living together	3.884	3.154	0.069	1.23	.219	-2.323, 10.091	1.07
Self-care	-4.906	1.657	-0.173	-2.96	.003**	-8.167, -1.645	1.16
Alcohol use	7.669	2.213	0.201	3.47	.001**	3.313, 12.025	1.14
Total stigma score	0.141	0.059	0.144	2.40	.017*	0.025, 0.256	1.21
Model summary	$R = 0.348$, $R^2 = 0.121$, Adj.$R^2 = 0.092$, F change (1, 297) = 5.748, p = 0.017						

4.Discussion

This study examined the association between diabetes-related stigma and treatment adherence in adults with T2DM using a hierarchical regression model while controlling for key sociodemographic and clinical factors. The main finding indicates that higher levels of diabetes-related stigma are associated with poorer treatment adherence, and that stigma remains a significant independent predictor of adherence even after adjustment for relevant covariates such as self-care ability and alcohol consumption. However, the proportion of variance explained was modest, suggesting that treatment adherence is influenced by additional factors beyond those included in the present model. These findings highlight the need for future research to incorporate broader psychosocial, behavioral, and healthcare-system–related determinants to better explain adherence behavior in adults with T2DM.

The observed association between diabetes-related stigma and treatment adherence is consistent with growing evidence emphasizing the psychosocial burden of diabetes management. Recent studies and systematic reviews have reported that stigma is associated with poorer self-management behaviors, reduced treatment adherence recommendations, and suboptimal glycemic outcomes among individuals with T2DM (Akyirem et al., 2023; İşleyen & Özdemir, 2024; Li et al., 2023). Collectively, these findings suggest that diabetes-related stigma may function as a multidimensional psychological barrier,

influencing adherence through emotional distress, reduced self-efficacy, and avoidance-based coping behaviors. In this context, stigma may contribute to a cycle of reduced treatment engagement, in which negative self-perceptions and perceived judgment reinforce non-adherent behaviors over time. Therefore, addressing diabetes-related stigma should be considered an integral component of comprehensive diabetes care strategies aimed at improving long-term treatment adherence.

Importantly, this study extends the literature by showing that diabetes-related stigma remains a significant predictor of treatment adherence even after controlling for sociodemographic and clinical factors, including age, gender, diabetes duration, treatment type, self-care ability, and alcohol consumption. Previous studies have primarily examined related constructs such as patient activation, perceived stigma, self-care behaviors, or medication adherence outcomes, often within different conceptual frameworks or mediation pathways (İşleyen & Özdemir, 2024; Kato et al., 2020; Sedaei et al., 2025; Yamamoto et al., 2025). In contrast, the present study contributes by applying a hierarchical regression framework to examine the independent contribution of a multidimensional diabetes-related stigma measure to overall treatment adherence. Taken together, these findings suggest that stigma may be an additional psychosocial factor to consider in comprehensive models of diabetes self-management, alongside established clinical and behavioral determinants.

Among the covariates, self-care ability and alcohol consumption were significant predictors of treatment adherence. Independence in self-care was associated with better adherence, underscoring the importance of functional autonomy and self-management capacity in chronic disease management. This finding aligns with prior evidence that patients with higher self-management capacity and greater functional independence are more likely to engage in recommended diabetes care behaviors, including medication use, dietary regulation, and blood glucose monitoring (García-Molina et al., 2020; Schlesinger et al., 2020). Self-management ability has been conceptualized as a core component of effective diabetes control, encompassing not only physical capacity but also behavioral organization and health-related decision-making skills. In this context, full independence in self-care may facilitate more consistent adherence by enabling structured and routine disease management practices, whereas partial dependence may introduce additional barriers to consistency and autonomy in care behaviors.

Additionally, alcohol consumption among adults with T2DM has been suggested to be associated with suboptimal self-management behaviors and reduced engagement in health-promoting activities. Although evidence remains heterogeneous regarding the strength of this association, alcohol use has been conceptualized as a behavioral risk marker reflecting lower health prioritization and reduced self-regulatory capacity in chronic disease management (Oliveira et al., 2023; Shah et al., 2025; Yosef et al., 2023). From a behavioral perspective, alcohol consumption may be considered a risk marker for lower health prioritization and reduced self-regulatory capacity, both of which are important for sustained diabetes self-management. Therefore, routine assessment of alcohol use and targeted counseling may be considered part of comprehensive diabetes care strategies.

Although diabetes-related stigma was identified as a significant independent predictor of treatment adherence, the final model's relatively modest explanatory power suggests that adherence behavior in adults with T2DM is multifactorial and influenced by additional unmeasured determinants. This finding is consistent with a hospital-based study of 346 Chinese adults with T2DM, in which higher stigma scores were significantly associated with lower medication adherence, and stigma explained approximately 9% of the variance in adherence behavior (Li et al., 2023). While the effect size is modest, this converging evidence supports the role of diabetes-related stigma as a statistically significant yet partial determinant of adherence behavior.

Evidence from broader quantitative, qualitative, and review-based literature further reinforces this relationship, indicating that diabetes-related stigma is associated with poorer adherence to both pharmacological and non-pharmacological treatment regimens. Proposed mechanisms include concealment of the disease to avoid disclosure in social or clinical settings, internalized shame and reduced self-worth, and weakened patient–provider relationships, all of which may undermine sustained self-management behaviors. Systematic and narrative reviews similarly suggest that stigma is associated with reduced engagement in key self-care behaviors, including medication adherence, dietary regulation, glucose monitoring, and physical activity among adults with T2DM (Akyirem et al., 2023; Eitel et al., 2024). Findings from diverse cultural contexts further support this pattern. In Arabic-speaking populations, higher levels of diabetes-related stigma have been associated with lower adherence to diet, physical activity, and foot care practices, indicating that stigma may broadly affect multiple domains of self-management (Alzubaidi et al., 2023). Similarly, studies conducted in African settings have reported that stigma contributes to non-adherence to prescribed treatment regimens and follow-up appointments, with some individuals concealing their diagnosis and substituting prescribed medications with over-the-counter alternatives, reflecting avoidance-based coping behaviors (Akyirem & Ekpor, 2023).

Taken together, these findings suggest that diabetes-related stigma may serve as a cross-cultural and multidimensional barrier to effective diabetes self-management. Rather than influencing a single domain of behavior, stigma appears to affect adherence through interconnected emotional, cognitive, and behavioral pathways that collectively reduce engagement in long-term treatment strategies. This underscores the importance of integrating stigma-sensitive approaches into diabetes care, particularly within nursing-led education, counseling, and self-management support interventions.

4.1. Strengths and Limitations

The main strength of this study is that, to the best of our knowledge, it is among the first to examine the association between diabetes-related stigma and treatment adherence in adults with type 2 diabetes mellitus, using validated multidimensional instruments and a hierarchical regression approach. The study focused on the relationship between total diabetes-related stigma and overall treatment adherence while controlling for relevant sociodemographic and clinical covariates, thereby strengthening the internal validity of the findings and reducing potential confounding. An additional strength is the acceptable-to-good internal consistency of the main study variables, particularly the total diabetes-

related stigma scale (Cronbach's alpha = 0.88) and the overall treatment adherence scale (Cronbach's alpha = 0.73), which supports the reliability of the primary outcomes. The relatively large sample size further enhances statistical power and the precision of the estimates.

This study has several limitations. First, the single-center design and convenience sampling method may limit the generalizability of the findings to broader populations of adults with type 2 diabetes mellitus. Second, although the overall reliability of the main scales was acceptable, some subdimensions of the treatment adherence scale demonstrated relatively low internal consistency. Therefore, caution is warranted when interpreting findings related to the subdimensions, as the primary analyses of this study focused on total diabetes-related stigma and overall treatment adherence. Finally, the cross-sectional design precludes any causal inference regarding the observed associations. Future research using longitudinal designs and multicenter samples may provide stronger evidence regarding the temporal relationships between diabetes-related stigma and treatment adherence.

5. CONCLUSION

Diabetes-related stigma is a significant psychosocial determinant of treatment adherence in adults with T2DM. The findings indicate that higher levels of perceived and experienced T2DM stigma are associated with poorer treatment adherence, even after adjusting for key sociodemographic and clinical factors. In addition, self-care ability and alcohol consumption were identified as significant predictors of adherence, highlighting the multifactorial nature of treatment adherence in diabetes management.

These results suggest that treatment adherence in T2DM cannot be fully understood through clinical indicators alone, but should also be considered within the context of patients' stigma-related experiences. Therefore, routine assessment of diabetes-related stigma using validated instruments such as the diabetes-related stigma scale may help identify individuals at risk of poor adherence. From a clinical practice perspective, these findings underscore the need for integrated care approaches that address both behavioral and psychosocial determinants of treatment adherence. Interventions to reduce stigma-related distress, strengthen self-care ability, and address harmful health behaviors, such as alcohol use, may improve treatment outcomes in adults with T2DM.

Declarations

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author Contribution

SK and ŞTY contributed to conceptualization, funding acquisition, investigation, methodology, software, supervision, validation, resources, visualization, writing – original draft, and writing – review & editing. SK was responsible for data collection and project administration. ŞTY performed the formal analysis.

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Data Availability

All data supporting the findings of this study are available within the paper .

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