

Diabetes Distress and Treatment Adherence in Individuals with Type 2 Diabetes Mellitus: The Mediating Effect of Diabetes Stigma, and The Moderating Role of Social Support

Sana Latif¹, Qasir Abbas², Saima Rashid³, Arif Nadeem⁴, Umar Khan⁵

¹ PhD Scholar, Department of Applied Psychology, Government College University Faisalabad, Email: sanalateef282@gmail.com

² Tenured Associate Professor, Department of Applied Psychology, Government College University Faisalabad, Email: drqasirabbas@gcuf.edu.pk, qasirabbas47@yahoo.com

³ Assistant Professor, Department of Physiology, Dow International Medical College, Dow University of Health Sciences, Email: saima.rashid@duhs.edu.pk, rashidsaima952@gmail.com

⁴ Assistant Professor, Department of Applied Psychology, Government College University Faisalabad

⁵ Assistant Professor, Department of Applied Psychology, Government College University Faisalabad

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Abstract

Diabetes mellitus is a persistent physiological disorder that carries significant psychological and psychosocial implications. Diabetes distress and medication adherence are significant psychological and behavioral factor for achieving optimal diabetes management, yet different psychological and social elements can substantially affect diabetes distress and treatment related adherence among individuals having type II diabetes mellitus (T2DM). The aim of the present study was to assess the co-relationship between diabetic distress, diabetes stigma, perceived social support, and medication adherence, emphasizing the mediating and moderating dynamics of these associations. We employed cross-sectional methodology utilizing a sample of 409 individuals diagnosed with T2DM. Participants filled out self-assessment tools for diabetes distress (DDS), diabetes stigma (DSAS), perceived social support (MSS), and medication compliance (HBMAS). Data were examined from SPSS, Pearson product-moment correlations, and PROCESS for mediation and moderated analyses employing bootstrapping. Diabetes distress exhibited a positive correlation with diabetes stigma ($r = .704$, $p < .001$), while demonstrating a significant and negative correlation with medication adherence ($r = -.673$, $p < .001$). The stigma associated with diabetes had a negative correlation with adherence to medication ($r = -.633$, $p < .001$). Mediation analysis revealed that diabetes stigma notably mediated the relationship between diabetic distress and medication adherence, exhibiting a substantial indirect effect ($B = -0.117$, 95% CI $[-0.155, -0.080]$). The moderation analysis shows that social support act as buffer as the model was significant, $F(3, 405) = 151.21$, $p < .001$, and accounted for 52.8% of the variance in medication adherence. The relationship between diabetes related distress and social support was notable, $B =$

.020, SE = .003, $t = 7.38$, $p < .001$, 95% CI [0.014, 0.025], contributing an additional 6.3% to the variance.. The results highlight the significance of psychological elements such as diabetic distress, diabetes-related stigma, in elucidating medication compliance among individuals with T2DM. The findings suggest that interventions aimed at enhancing adherence must take into account psychological distress and stigma, alongside medication-related behaviors.

Keywords: Type II Diabetes Mellitus, Diabetes Distress, Medication Adherence, Diabetes Stigma, Social Support

Introduction:

Diabetes mellitus is a chronic physiological ailment that has significant psychological and emotional consequences, impacting individuals on a daily basis (Artasensi et al., 2020) characterized by elevated blood glucose levels (Popoviciu et al., 2023), which can cause substantial damage to multiple organs over time (Galicia-Garcia et al., 2020; Kretchy et al., 2020). It is a prominent global risk factor contributing to illness, disability, and death (Hameed et al., 2015; Tancredi et al., 2015), and is associated with the increasing number of unhealthy behaviors (Siddiqui et al., 2024), such as insufficient physical activity, poor dietary practices, and insufficient exercise (Himanshu et al., 2020; Ho et al., 2023).

Worldwide, over 500 million adults, or more than 1 in 9 people, currently have diabetes, with the majority being type 2 patients (Ahmad et al., 2022; Chatterjee et al., 2017; Geng et al., 2026). The Global Burden of Disease Study indicates that in 2023, there were 561 million adults with diabetes, a figure projected to increase to 1.3 billion by 2050 if prevailing trends persist (Liu et al., 2020; Ong et al., 2023). Asia is a significant region in the rapidly growing global epidemic of T2DM (Zheng et al., 2018). This growing burden of diabetes is not limited to physical issues and blood glucose regulation it also has a substantial psychological impact, which is now recognized as the primary factor in the effective management of diabetes, rather than a secondary one (Kalra et al., 2018; Robinson et al., 2023).

Diabetes distress is the negative psychological impact arises from the demands of diabetes mellitus,(Fisher et al., 2019; Skinner et al., 2020) including the anxiety, exhaustion, and frustration (Fisher et al., 2008) that accompany the constant monitoring of glucose levels (Gahlan et al., 2018), the strict adherence to diet and medication regimens, and the consistent risk of complications(Onyenekwe et al., 2020). In light of the emotional and concrete requirements of diabetes self-management, diabetes distress is a diabetes-specific distress that fluctuates over the time (Dennick et al., 2015). There are a substantial proportion of individuals with T2DM who experience clinically significant diabetes distress (Ahmed et al., 2025; Aljuaid et al., 2018). Diabetes distress has been consistently identified as a psychological barrier to poor diabetes outcomes when left untreated (Iturralde et al., 2019; Wang et al., 2017).

Treatment adherence, including medication use, healthy diet, physical activity, and regular glucose monitoring, is essential for effective management of T2DM (Al-Qazaz et al., 2011). Although practical barriers such as treatment cost, access to healthcare, complex regimens, psychological and social factors contribute to the non-adherence among diabetes patients (Curkendall et al., 2013; McGovern et al., 2018; Waari et al., 2018). Diabetes distress, diabetes stigma, and health anxiety also interfere with treatment adherence through different pathways. Diabetes distress can lead to

emotional exhaustion and avoidance of self-care (Cyranka et al., 2024), stigma reduce willingness to engage in or disclose treatment behaviors (Kato et al., 2016a), while health anxiety result in either excessive or avoidant health-related behaviors (Janzen Claude et al., 2014). Evidence from the studies, indicates that greater diabetes distress is associated with poorer medication adherence over time (Gonzalez et al., 2015; Kretchy et al., 2020). However, the relationship between distress and adherence may be influenced by individuals' experiences of stigma (Eitel et al., 2024a; X. Li et al., 2023), beliefs about their illness, and concerns about their health related anxiety (Kiliç & Öz, 2025). Despite their potential importance, these three psychological factors have rarely been examined together within a single integrated framework.

Individuals with T2DM also encounter stigma from family, friends, healthcare professionals, the workplace, or society, and they may have internalized adverse perceptions regarding their illness (Schabert et al., 2013). Diabetes stigma denotes the adverse social appraisal, stereotype, discrimination, blame, or devaluation directed toward those with diabetes (Speight et al., 2024). This may prove especially challenging in situations where diabetes correlates with the burden of duty, lifestyle choices, weight, or the apparent incapacity to adequately control the condition (Gredig & Bartelsen-Raemy, 2017). Studies have shown that psychological and behavioral consequences are linked to the stigma around diabetes (Eitel et al., 2024). The comprehensive review and meta-analysis of T2DM stigma significant correlations between diabetes stigma and diminished self-management of diabetes, along with a link between diabetes stigma and diabetes-related distress (Akyirem et al., 2023; Kato et al., 2016b). Studies indicate that stigma could function as a significant psychosocial factor linking the emotional impacts of diabetes to behaviors associated with its management and contribute to diabetes distress and poor medication adherence (Guo et al., 2023; X. Li et al., 2023; Xing et al., 2023).

Social support, characterized as the perceived availability of emotional, informational, and practical assistance from relatives, friends, and the community, has long been theorized as a supporting factor that alleviates the negative psychological impacts of chronic illness (Gallant, 2003; Maguire et al., 2021). Social support does not uniformly improve wellbeing instead, it specifically alleviates the relationship between diabetes distress (Baek et al., 2014a; Chan et al., 2020) and negative consequences such as inadequate adherence for diabetes patients (H. Li et al., 2025; Scheurer et al., 2012). Despite a solid theoretical basis, there is relatively little empirical research investigating social support as a moderating factor rather than simply a correlational element within the diabetes distress, stigma, health anxiety and treatment adherence framework, prompting enquiries into the conditions under which support may exert its protective influence in the psychological mechanism.

Despite the recognition of diabetes distress, stigma, and social support as significant independent variables affecting treatment adherence in T2DM, these elements have seldom been combined into a unified mediated-moderation framework that could collectively impact outcomes in T2DM. It remains ambiguous whether stigma function as sequential psychological processes that mediate the relationship between diabetic distress and adherence behaviour, and if social support significantly mitigates this pathway. The present research examines how diabetic distress forecasts treatment adherence in adults with T2DM, considering diabetes stigma as concurrent mediators, whereas social support acts as a moderator in the connection between psychological distress and adherence behaviour in patients with T2DM.

The following hypothesis were addressed in this study:

1. Diabetes distress will be negatively associated with treatment adherence in patients diagnosed with T2DM.
2. Diabetes distress will be positively associated with diabetes related stigma in patients diagnosed with T2DM.
3. Diabetes related stigma will be negatively associated with treatment adherence in patients diagnosed with T2DM.
4. Diabetes related stigma will mediate the relationship diabetes distress and treatment in patients diagnosed with T2DM.
5. Social support will moderate the relationship between diabetes distress and treatment adherence in patients diagnosed with T2DM.

Method

The cross-sectional correlational methodology was implemented in this study to investigate the relationships between the variables under investigation in individuals with Type 2 Diabetes Mellitus (T2DM). The total 409 of participants took part in the study. Inclusion and exclusion criteria were implemented to include individuals diagnosed with T2DM. The participants must be diagnosed with T2DM and be between the ages of 25 and 45. Excluded from the study were individuals with substantial physical or mental health conditions, or physical limitations that could threaten their participation or completion of the assessments. The demographic and clinical characteristics of the final cohort are presented in Table 1.

Instruments

The research was conducted utilising an extensive evaluation instrument. This comprised a consent form, a demographic questionnaire, and a collection of standardised psychological evaluations. The informed consent statement delineates the objectives and aims of the study, assures participants of their absolute confidentiality, and informs them of their voluntary right to participate and withdraw from the research. The demographic questionnaire necessitated that participants disclose information about their demographic traits, such as age, gender, marital status, educational qualifications, illness duration, treatment type, and family history, among others. The subsequent research instruments were employed in the investigation.

Diabetes Distress Scale (DDS-17; Polonsky et al., 2005) Diabetes-associated distress is assessed by the Diabetes Distress Scale (DDS-17). It comprises 17 items. Every component of the DDS-17 utilises a six-point Likert scale that spans from 1 (no issue) to 6 (an extremely severe issue). A comprehensive DDS-17 score was calculated by aggregating a patient's responses to 17 items and dividing by the total number of items on the scale. DDS-17 evaluates other elements such as emotional, physician, regimen, and interpersonal distress. The reliability was assessed utilising Cronbach's alpha, yielding a value of 0.98.

Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). The 12-item MSPSS evaluated perceived social support utilising a 7-point Likert scale (1 = Very strongly disagree, 2 = Strongly disagree, 3 = Mildly disagree, 4 = neutral, 5 = Mildly agree, 6 = Strongly agree, and 7 = Very strongly agree). The total for all 12 items is calculated and then divided by 12 to get a composite score.

Diabetes Stigma Assessment Scale (DSAS (Browne et al., 2016)). This scale assesses the stigma experienced by individuals with diabetes. The DSAS-2 consists of 19 items assessed using a 6-point Likert scale, ranging from 1 (Strongly Disagree) to 6 (Strongly Agree). Heightened scores indicate a greater awareness of stigma. The DSAS-2 has been widely employed and validated among various diabetes populations.

Hill Bone Medication Adherence Scale (HBMAS; Kim et al., 2000). The Hill-Bone adherence to High Blood Pressure Therapy Scale (Hill-Bone Scale) was employed to measure medication adherence, having been adapted for this study to explore the medication-taking practices of those with Type 2 Diabetes Mellitus (T2DM) (Mishra et al., 2023). It analyses medication adherence practices, including obstacles such as complications in adhering to specified schedules and cases of neglected prescriptions. Increased scores suggest inferior drug adherence, whilst decreased levels imply better compliance.

Procedure:

Following an extensive review of existing literature, the study was formulated to assess the relationship among diabetes distress, diabetes stigma, social support, and medication adherence in patients diagnosed with type 2 diabetes. After the departmental research committee assessed the request, it was subsequently submitted to the Institutional Review Board (IRB), which finally granted approval for the study. The study employed a cross-sectional correlational design and implemented a purposive sampling method in clinical environments and hospitals in Faisalabad, Punjab, Pakistan. At the outset, 460 individuals aged 25 to 45 with Type 2 Diabetes Mellitus were invited to take part in the research. Nevertheless, 51 incomplete questions were discarded, leading to a total of 409 questionnaires being considered. A self-administered questionnaire was completed by eligible individuals following their acquisition of informed consent. The aim of the questionnaire was to assess diabetes-related distress, stigma linked to diabetes, social support, and compliance with treatment adherence. SPSS Version 27 was employed to conduct a comprehensive analysis of the data. The demographic and clinical attributes of the study were examined using descriptive statistics, while the Hayes MODMED 2.0 macro for SPSS was employed to perform correlation and mediation-moderation analysis to explore the interconnections among the research variables. The PROCEDURE was executed with the use of IBM SPSS Statistics, version 27.

Result:

Table 1: *Demographic details of T2DM Patients (N=409)*

Variable	Category	M ± SD	Frequency (n)	Percentage (%)
Age		37.49 ± 5.94		
Gender	Female		172	42.1
	Male		237	100
Marital Status	Married		391	95.5
	Unmarried		18	100
Education		1.85 ± 0.73		

Variable	Category	M ± SD	Frequency (n)	Percentage (%)
Family System	>Metric	1.43±0.49	145	35.5
	Intermediate		182	80
	Graduation and above		82	100
	Nuclear		232	56.7
	Joint		177	100
Religion	Muslim	1.40±.490	409	100.0
Profession	Employed		247	60.5
	Unemployed		162	100
Monthly Income		41,110.29 ± 16,947.37		
BGL		2.43±.672		
TOT	170–249	2.00. ± 803	42	10.3
	250–349		147	46.2
	350–500		220	100
	Medication		131	32.0
	Insulin		146	67.7
	Insulin + Medication		132	100
DOT		1.94± 0.81		
	1 year		146	35.7
	2-3 years		139	69.7
	4-6 years		124	100

NOTE: M= Mean; SD= Standard Deviation; BGL= Blood Glucose Level; TOT= Type of Treatment; DOT= Duration of Treatment

Study sample Includes 409 participants; the mean age was 37.49 years (SD = 5.94). Gender distribution was 237 (58.0%) male, 172 (42.1%) female. Most participants were married (n = 391, 95.5%), with 18 single (4.4%). Education levels were 145 (35.5%) up to matriculation, 182 (44.5%) intermediate, and 82 (20.0%) graduate or higher. Most participants were nuclear families (n = 232, 56.7%) and 177 (43.3%) joint families. All candidates were Muslim. Professionally, 247 (60.4%) were employed and 162 (39.6%) were unemployed. The average monthly income was

41,110.29 (SD = 16,947.37). The participants' blood glucose levels were divided into three groups: 42 (10.3%) had 170–249 mg/dL, 147 (36.0%) had 250–349, and 220 (53.8%) had 350–500. Medicine was given to 131 (32.0%), insulin to 146 (35.7%), and both to 132 (32.3%). Mean treatment time was 1.94 years (SD=.81). Treatment lasted 1 year in 146 (35.7%), 2–3 years in 139 (34.0%), and 4–6 years in 124 (30.3%). (Table 1)

Table 2: Descriptive Statistics for Study Variable of T2DM Patients (N=409)

	<i>M</i>	<i>SD</i>
EBS	17.58	2.98
PDS	17.43	3.00
RDS	14.04	2.48
IDS	10.51	1.87
DDS.T	59.56	9.63
TDS	17.96	3.55
BJS	17.92	3.55
SSS	20.89	4.12
DSAS.T	56.78	10.73
So	16.01	2.33
Fam	16.07	2.49
Frnd	16.04	2.44
MSS.T	48.12	6.78
HBMAS.T	27.07	5.06

Note: EBS; Emotional burden Subscale, PDS; Physician related Distress, RDS; Regimen related distress, IRS; Interpersonal Distress, DDS; Diabetes Distress Scale, HA; Health Anxiety, NC; Negative Consequence, SHAI; Short Health Anxiety inventory, TDS; Treated Differently Subscale, BJS; Blame and Judgement Subscale, SSS; Self Stigma Subscale, DSAS; Diabetes Stigma Assesment Scale, So; Social, Fam; Family, Frnd; Friends, MSPSS; Multidimensional Social Support Scale, HBMAS; Hillborne Medication Adherence Scale

Findings shows that mean score for diabetic distress were 17.58 (SD = 2.98) for emotional burden, 17.43 (SD = 3.00) for physician-related burden, 14.04 (SD = 2.48) for regimen-related misery, and 10.51 (SD = 1.87) for interpersonal distress. The average total score on the diabetes distress scale was 59.56 (SD = 9.63). The average scores for diabetes stigma were 17.96 (SD = 3.55) for being treated differently, 17.92 (SD = 3.55) for blame and judgement, and 20.89 (SD = 4.12) for self-stigma, resulting in a total diabetes stigma assessment scale score of 56.78 (SD = 10.73). Mean scores for social support did not exhibit significant variation across significant others (M = 16.01, SD = 2.33), family (M = 16.07, SD = 2.49), and friends (M = 16.04, SD = 2.44), yielding an aggregate score of 48.12 (SD = 6.78) on the MSPSS. Ultimately, the average medication related

adherence, was 27.07 (SD = 5.06). In conclusion, the results indicate that diabetic distress, stigma, social support, and medication adherence exhibit significant variability (Table 2).

Table 3 : *Pearson Corelation for Study variables among T2DM Patients (N=409).*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
EBS	—												
PDS	..851**	—											
RDS	.838**	.836**	—										
IDS	.806**	.812**	.765**	—									
DDS.T	.947**	.948**	.926**	.893**	—								
TDS	.647**	.628**	.623**	.594**	.672**	—							
BJS	.637**	.634**	.611**	.576**	.664**	.856**	—						
SSS	.658**	.648**	.629**	.600**	.684**	.879**	.879**	—					
DSAS.T	.677**	.667**	.649**	.617**	.704**	.952**	.951**	.965**	—				
So	−.063	−.087	−.047	−.059	−.070	.252**	.270**	.270**	.276**	—			
Fam	−.005	−.037	−.001	−.030	−.019	.252**	.291**	.276**	.286**	.810**	—		
Frnd	−.019	−.007	.016	.001	−.004	.278**	.319**	.314**	.318**	.818**	.805**	—	
MSS.T	−.030	−.046	−.011	−.031	−.032	.279**	.314**	.307**	.314**	.935**	.934**	.936**	

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
HBMAS.T	-.640**	-.641**	-.605**	-.614**	-.673**	-.604**	-.609**	-.604**	-.633**	-.066	-.078	-.106*	-.090

Note: EBS; Emotional burden Subscale, PDS; Physician related Distress, RDS; Regimen related distress, IRS; Interpersonal Distress, DDS; Diabetes Distress Scale, HA; Health Anxiety, NC; Negative Consequence, SHAI; Short Health Anxiety inventory, TDS; Treated Differently Subscale, BJS; Blame and Judgement Subscale, SSS; Self Stigma Subscale, DSAS; Diabetes Stigma Assessment Scale, So; Social, Fam; Family, Frnd; Friends, MSPSS; Multidimensional Social Support Scale, HBMAS; Hillborne Medication Adherence Scale

The corelation study showed that EBS, PDS, RDS and IDS had a substantial positive connection with the total diabetes distress score DDS with values ranging from $r = .893$ to $.948$, $p < .01$. Similarly, the diabetes stigma subscales TDS, BJS and SSS were highly positively correlated with the overall diabetes stigma score DSAS values ranging from $r = .951$ to $.965$, $p < .01$. Diabetes distress was positively and significantly linked with diabetes stigma $r = .704$, $p < .01$, so that increased levels of diabetes distress were linked with increased levels of diabetes stigma. Conversely, DDS was strongly negatively correlated with medication adherence HBMAS. Medication adherence was inversely correlated with diabetes-related distress, $r = -.673$, $p < .01$. Additionally, diabetes stigma was significantly negatively linked with medication adherence, $r = -.633$, $p < .01$, suggesting that increased levels of diabetes stigma were linked with lower levels of medication adherence. All subscales of the social support So, Fam, Frnd, were strongly positively correlated with MSS.T with correlation coefficients ranging between $r = .934$ and $r = .936$, $p < .01$. Overall social support was not significantly correlated with diabetic distress ($r = -.032$, $p = .514$) or medication adherence ($r = -.090$, $p = .071$). The only source of individual social support that was small but statistically significantly negatively related $r = -.106$, $p = .032$ to medication adherence was that of friends. (Table 3).

Table 4: Mediation Analysis of DSAS in Association between DDS, HBMAS among T2DM Patients (N=409)

Antecedents	Diabetes Stigma				Medication Adherence				P
	P	B	SE	t	P	B	SE	t	
DDS	0.588	0.577	0.033	17.61	< .001	-0.242	0.030	-8.17	< .001
DSAS						-0.196	0.031	-6.27	< .001
		R ² =.684				R ² =.723			
		F(2, 406)=438.60				F(4, 404)=275.86			

Note: DDS; Diabetes Distress Scale, DSAS; Diabetes Self-Management Scale. HBMAS; Hillborne Medication Adherence Scale, B= Unstandardized Regression Coefficient, SE= Standard Error

Table 5: Direct and Indirect effect of DDS, HBMAS through DSAS among T2DM Patients (N=409)

Effect	B	SE	95% CI	
			LL	UL

Direct effect: DDS → HBMA	−0.242	0.030	−0.301	−0.184
Total indirect effect	−0.090	0.025	−0.139	−0.040
DDS→ DSAS → HBMA	−0.113	0.026	−0.164	−0.061

Note: SE; Standard Error, LLCI; Lower Limit Confidence Interval, ULCI; Upper Limit Confidence Interval.

The results suggested a substantial indirect correlation between adherence to medication and diabetes-related distress through the proposed mediators. In the final model, DSAS exhibited an association with medication adherence, which led to a substantial specific indirect effect. Increased diabetes distress was associated with elevated stigma, which was subsequently associated with decreased medication adherence. Consequently, the indirect influence of diabetes stigma was substantial. After controlling for mediator, medication adherence was directly correlated with diabetic distress. The hypothesis that stigma functioned as a mediator was verified. The findings indicate that stigma may be a more significant pathway connecting diabetes distress to medication adherence in this study. Table 4, 5).

Table 6: Moderation Analysis of the Association between DDS, HBMA through MSS among T2DM Patients (N=409)

Predictor	B	SE	T	P	95% CI	
					LLCI	ULCI
Constant	40.455	2.039	19.84	< .001	36.447	44.463
DDS	−0.394	0.029	−13.59	< .001	−0.451	−0.337
MSS	0.251	0.054	4.68	< .001	0.146	0.357
DDS × MSS	0.003	0.001	3.64	< .001	0.001	0.005
Model Fit	$R = .920, R^2 = .846, F(3, 405) = 740.46, p < .001.$					

Note: DDS; Diabetes Distress Scale, HBMA; Hillborne Medication Adherence Scale, MSS; Multidimensional Social Support Scale, B= Unstandardized Regression Coefficient, SE= Standard Error, , LLCI; Lower Limit Confidence Interval, ULCI; Upper Limit Confidence Interval,

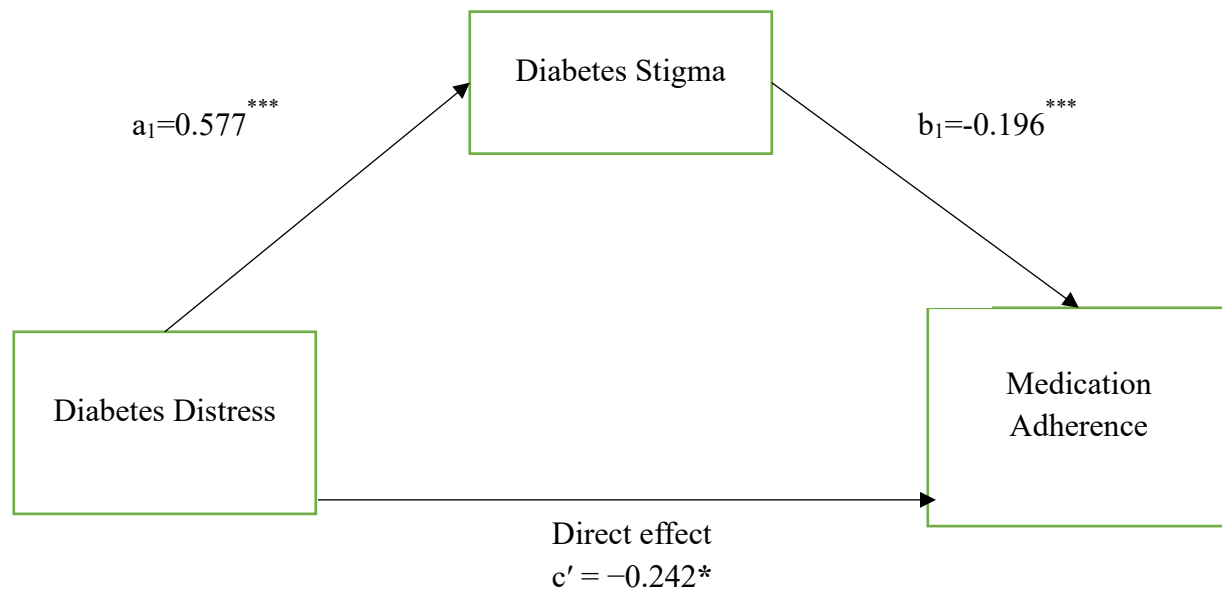
Table 7: Conditional effect of DDS on HBMA at different level of MSS among T2DM Patients (N=409)

MSS	DDS	SE	T	P	95% CI	
					LL	UL
Low	−0.339	0.017	−20.28	< .001	−0.372	−0.306
Moderate	−0.302	0.013	−23.88	< .001	−0.327	−0.277
High	−0.265	0.016	−16.94	< .001	−0.296	−0.235

Note: SE; Standard Error, LL; Lower Limit, UL; Upper Limit, CI; Confidence Interval,

A moderation study examined how perceived social support affects diabetic distress and medication adherence. A significant factor ($F(3, 405) = 740.46, p < .001$) explained 84.6% of the difference in confidence in changing adherence-related practices. Distress from diabetes was substantially connected to lower medication adherence, while social support increased it. A significant correlation exists between diabetic distress and perceived social support ($B = 0.003, SE = 0.001, t = 3.64, p < .001, 95\% CI [0.001, 0.005]$). The interaction accounted for an additional 0.5% variation in medication adherence ($\Delta R^2 = .005, F(1, 405) = 13.23, p < .001$). Conditional effects demonstrated that diabetic distress negatively correlated with lower, moderate, and high perceived social support. As social support increased, the unfavorable correlation decreased. $B = -0.339$ at $MSS = 18, -0.302$ at 30, and -0.265 at 42. The negative relationship between diabetic distress and adherence improved with perceived social support. Even with more perceived social support, the negative correlation persisted; the conditional association was statistically significant across all three levels. The results indicate that perceived social support diminishes the adverse relationship between diabetic discomfort and adherence to treatment.

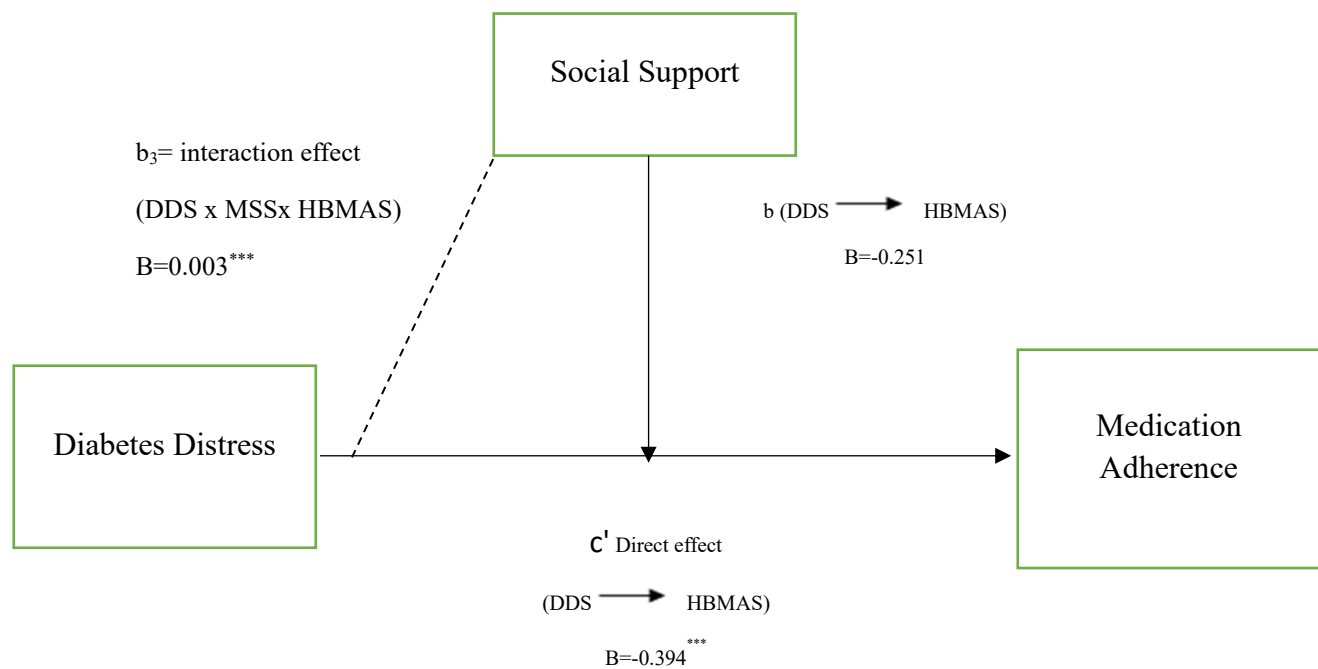
Figure 1: *The Mediating Role of Diabetes Stigma in relation to Diabetes Distress and Medication adherence among T2DM Patients (N=409)*



The mediation model is proposed in this figure. This model posits that the relationship between diabetes distress and medication adherence is clarified by diabetes stigma. The relevant table

provides a comprehensive overview of the bootstrap confidence intervals and statistical significance, while the figure encapsulates the direct and indirect pathways that were examined in the mediation study (Figure 1).

Figure 2: *The Moderating Role of Social-Support on Diabetes Distress and Medication adherence among T2DM Patients (N=409)*



This figure presents the moderation effect of social support in association with diabetes distress and medication adherence. A thorough summary of the conditional effects, bootstrap confidence intervals and statistical significance can be found in the above given table, and the figure summarizes the routes that were investigated in the mediation investigation, both direct and indirect (Figure 2).

Discussion:

This research examined the relationships among diabetic distress, diabetes-related stigma, perceived social support, and adherence to medication in individuals with T2DM. The research specifically investigated if diabetes stigma acted as a mediator between diabetic distress and adherence to medicine, and whether perceived social support influenced this association. The

research sample comprised 409 individuals. These results support the interconnectedness of psychological and behavioral factors, including diabetes distress, diabetes stigma, social support, and medication adherence, which may affect self-management in diabetes.

Our findings demonstrate a significant correlation between diabetic distress and diabetes stigma. Correlation analysis indicated a substantial relationship between diabetes related distress and diabetes stigma, $r = .704$, $p < .001$. The subscale of diabetes distress was notably significant and positively linked with diabetes stigma and its subscale. The outcomes achieved are consistent to the earlier findings that indicated if individuals perceive diabetes as a source of societal criticism or scrutiny, the psychological consequence of managing the condition may be exacerbated (Guo et al., 2023; Kato et al., 2016a; Morales-Brown et al., 2024). Conversely, persistent stress associated with diabetes may increase the likelihood of adverse social encounters and feelings of stigmatization (Schabert et al., 2013).

The present research identified a notable inverse association between diabetes-related distress and adherence to treatment. Diabetes distress exhibited a negative correlation with medication adherence, $r = -.673$, $p < .001$. This study suggests that increased diabetes distress correlates with less adherence to medication which is consistent with findings of previous studies. Elevated emotional stressors can hinder individuals from continuously participating in diabetes management activities (Gonzalez et al., 2015; McGovern et al., 2018). Frustration, fatigue, anxiety, and a sense of being overwhelmed by diabetes management can all hinder an individual's capacity or drive to adhere to recommended treatment procedure (Kalra et al., 2018; Tareen & Tareen, 2017).

A significant finding was the substantial negative correlation between diabetes stigma and medication compliance. The stigma associated with diabetes was negatively correlated with adherence to medication, $r = -.604$, $p < .001$. The subscale of stigma exhibited a notable negative correlation with medication adherence. Consequently, studies also show that experiencing heightened stigma associated with diabetes may encounter more challenges in following their prescribed treatment plan (X. Li et al., 2023). Emotional difficulties of managing diabetes might arise when individuals begin to perceive themselves negatively due to their condition (Sedaei et al., 2025). Consequently, compliance with medicine may not just depend on a person's comprehension of the importance of treatment but may also stem from their perception and interpretation of the social implications of diabetes (Akyirem et al., 2023).

The mediation study offered a vital explanation of the connection between diabetes-related distress and treatment compliance. Diabetes distress was a substantial predictor of diabetes stigma, $B = 0.785$, $SE = 0.039$, $t = 20.01$, $p < .001$. The stigma linked to diabetes significantly forecasted medication compliance, $B = -0.149$, $SE = 0.023$, $t = -6.40$, $p < .001$. Furthermore, the stigma associated with diabetes served as a mediator for the indirect effect of diabetic distress on adherence to medication, $B = -0.117$, $BootSE = 0.019$, 95% CI $[-0.155, -0.080]$. The indirect impact was validated as the bootstrap confidence interval did not encompass zero. These results indicate that diabetic distress may be associated with poor medication compliance, partly attributable to heightened diabetes stigma. Prior research indicates that persons with heightened diabetes distress may also suffer from higher stigma (Mostafavi et al., 2021), which is associated

with reduced adherence to medicine (Aljuaid et al., 2018; Iturralde et al., 2019; X. Li et al., 2023).

The immediate impact of diabetes distress on medication compliance persisted as significant following the incorporation of diabetes stigma into the model, $B = -.237$, $SE = .026$, $t = -9.14$, $p < .001$. This pattern aligns with partial mediation. Consequently, the stigma associated with diabetes appears to contribute to the relationship between diabetic distress (Alzubaidi et al., 2023) and adherence to treatment (Olamoyegun et al., 2026), while it does not include the entirety of the correlation. This discovery is particularly significant for the examination of psychological processes related to medication compliance. This suggests that the relationship between emotional distress and medication adherence is not entirely uncomplicated. The association between diabetes-related distress and reduced adherence may be partially attributed to the social and psychological experience of stigma.

The moderation study examined how perceived social support affected the strength of the relationship between diabetes distress and adherence to medication. The correlation between diabetes-associated distress and perceived social support was statistically significant, $B = 0.020$, $SE = 0.003$, $t = 7.38$, $p < .001$. The interaction added an additional 6.34% to the variation explained in medication adherence, $\Delta R^2 = .063$, $F(1, 405) = 54.43$, $p < .001$. The conditional effects demonstrated that the relationship between diabetic distress and medication compliance was significant at low, moderate, and high levels of perceived social support. With a reduced perception of social support, the effect of diabetes-associated distress on adherence to medicine was -0.496 . At a standard level of social support, the effect was -0.359 , but at a heightened level of social support, the effect was -0.221 . As a result, whereas diabetes distress consistently exhibited a negative link with medication adherence across all levels of social support, the severity of this detrimental correlation lessened with increased perceived social support. Individuals with elevated social support may exhibit improved coping strategies for the emotional difficulties associated with diabetes (Baek et al., 2014b; Chan et al., 2020; C.-J. Kim et al., 2015; Parviniannasab et al., 2024).

The study indicates a complex link between diabetes distress, diabetes stigma, social support, and medication adherence. Diabetes distress was linked to increased diabetes stigma and lower adherence to medication. Diabetic stigma was also linked to poorer medication adherence and partially moderated the interaction between diabetic distress and medication adherence. Meanwhile, perceived social support moderated the direct association between diabetic discomfort and medication adherence. The negative link between distress and adherence was largest at low levels of perceived social support, and weaker at high levels of perceived social support. However, social support did not significantly change the indirect effect via diabetes stigma.

Conclusion

The current research demonstrates a significant correlation among diabetic distress, diabetes-related stigma, perceived social support, and adherence to medication. Increased stigma associated with diabetes and reduced adherence to medication were correlated with diabetes-related distress.

The stigma associated with diabetes somewhat influenced the relationship between diabetic distress and adherence to medication. The perceived social support notably influenced the direct relationship between diabetic distress and adherence to medication, whereby the adverse connection diminished as perceived social support increases. Nonetheless, the perceived social support did not substantially mitigate the indirect effect of diabetes-related distress on medication adherence through diabetes stigma. The results underscore the need of evaluating medication adherence within a wider psychological framework. Emotional distress and the stigma associated with diabetes may present significant obstacles to medication compliance, although perceived social support might serve as a beneficial resource. Diabetes management approaches may improve by including psychological distress therapy, stigma alleviation, and enhancement of social support with conventional medical and adherence-centered techniques.

Limitation of Study:

The study has particular limitations that must be addressed while analyzing its results. Initially, the cross-sectional design do not give causative or temporal inferences among diabetes distress, diabetes stigma, perceived social support, and medication adherence thus, the mediation results should be seen as statistical correlations rather than causal relationships. Secondly, the employment of self-report instruments may have led to biases in recollection and social desirability, especially for the disclosure of medication adherence and feelings of stigma. Third, the applicability of the results may be constrained as the sample might not accurately reflect individuals with diabetes across diverse demographic, socioeconomic, cultural, or healthcare settings. Perceived social support significantly influenced the direct relationship between diabetes distress and medication adherence, although it did not notably affect the indirect route via diabetes stigma, indicating a need for more investigation. Subsequent investigations ought to utilize longitudinal methodologies, incorporate more diverse cohorts, and implement objective assessments of medication compliance, when feasible. Furthermore, it ought to incorporate additional clinical and psychological factors to elucidate these relationships more effectively.

Implication of Study:

The study findings have important implications for the care of diabetes. First, routine assessment of diabetes distress may assist identify those at elevated risk of nonadherence to medication. Second, assessment of diabetes stigma may provide further information regarding psychological and social obstacles to diabetes treatment. Interventions that target diabetes distress could include techniques for emotion control, coping with the demands of chronic illness, problem-solving, and increasing confidence in diabetes self-management. Similarly, interventions targeting diabetes stigma could focus on challenging negative attitudes, lowering self-blame, enhancing self-acceptance and addressing experiences of social judgement. The moderating role of social support also implies that increasing supportive connections could be helpful. Family members and other significant others can be a positive force by offering emotional support, practical aid, encouragement and nonjudgmental communication regarding diabetes treatment.

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