

Self-Compassion in Patients with Type 2 Diabetes Can Mitigate the Destructive Effects of Glycosylated Hemoglobin (HbA1C) on Psychological Outcomes

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Abstract

Background: This study examined the mediating role of self-compassion in the relationships among Glycosylated Hemoglobin (HbA1c) levels, psychological well-being, and self-care behaviors in individuals with type 2 diabetes.

Methods: A sample of 368 individuals diagnosed with type 2 diabetes residing in northern Iran. Participants were recruited through purposive and consecutive sampling. Data collection involved administering validated psychometric instruments, including the Summary of Diabetes Self-Care Activities (SDSCA), the Ryff Scales of Psychological Well-Being (RSPWB), and the Self-Compassion Scale-Short Form (SCS-SF). HbA1c levels were measured within past 3 months. Data were analyzed using structural equation modeling (SEM) with AMOS-24. Bootstrapping analysis using the MACRO program was employed to examine the mediating relationships.

Results: HbA1c levels were significantly and negatively correlated with self-compassion ($r=-0.740$), psychological well-being ($r=-0.658$), and self-care behaviors ($r=-0.608$) ($P<0.01$). Self-compassion exhibited a significant positive relationship with psychological well-being ($r=0.760$) and self-care behaviors ($r=0.657$) ($P<0.01$). Following the implementation of model modifications, the structural model demonstrated an adequate fit with the data ($\chi^2/df=2.980$, GFI=0.921, IFI=0.956, PCFI=0.661, CFI=0.955, PNFI=0.648, RMSEA=0.078). The bootstrap analysis indicated that self-compassion significantly mediated the relationship between HbA1c levels and both psychological well-being ($P<0.001$) and self-care behaviors ($P<0.001$).

Conclusion: Self-compassion may function as a protective factor, mitigating the negative impact of elevated HbA1c levels on psychological well-being and self-care behaviors among individuals with diabetes. Healthcare professionals involved in diabetes management can leverage the moderating role of self-compassion in HbA1c levels, thereby enhancing patients' psychological well-being and promoting self-care behaviors.

Keywords: HbA1C, Self-compassion, Type 2 diabetes, Psychological well-being, Self-care

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Introduction

Type 2 diabetes is characterized by chronically elevated blood glucose levels, which are associated with insufficient insulin production and the body's ineffective response to insulin (1). The attainment and sustained management of optimal blood glucose levels in individuals with type 2 diabetes remains a persistent challenge within modern medicine (2). Glycosylated hemoglobin (HbA1c) serves as a biomarker for diagnosing and monitoring diabetes. It reflects average glucose levels over the preceding 8 to 12 weeks, and is commonly used in both research and clinical contexts to assess glycemic control (1). Lower HbA1c levels are indicative of improved glucose regulation and are linked to a decreased risk of adverse health outcomes (1). Within this context, the failure to achieve optimal HbA1c

levels, alongside potential physical repercussions, is frequently correlated with heightened psychological stress, which is associated with negative emotions, judgments of others, feelings of failure, and diabetes-related distress (3). Diabetes is a chronic disease that requires ongoing self-management, encompassing adherence to dietary guidelines, engagement in regular physical activity, and consistent medication compliance. This constant focus on health can be associated with a psychological burden and may negatively correlate with an individual's well-being. Hence, it is important to examine factors that are related to the health of individuals with diabetes (4). Some of these associated factors include stress, social support, high-risk situations, environmental systems, psychological distress, diabetes knowledge, self-efficacy, self-care skills,



and patient-caregiver communication (5). In this context, psychological problems, which are identified as factors linked to health outcomes in approximately one-third of individuals with diabetes, may play a critical role in treatment adherence (6).

Psychological well-being is one of the critical psychological constructs in individuals with type 2 diabetes. Systematic studies conducted over the past 25 years indicate that psychological well-being tends to be compromised in most diabetic patients (7). However, prior research has yielded inconsistent findings concerning the association between psychological well-being and HbA1c levels (8,9).

Ryff's theory posits that psychological well-being includes life goals, awareness of personal capacities, and the quality of interpersonal relationships (10). Indeed, psychological well-being involves positive emotions and cognitions that motivate individuals to evaluate their lives favorably (11). Research indicates that diabetic patients exhibit inappropriate emotional responses and experience low psychological well-being as a result of diabetes-related challenges, including diet, limitations on physical activity, invasive blood glucose monitoring, daily insulin injection, chronic physical complications, hospitalizations, and reduced life expectancy (12).

Mental health issues have been identified as substantial impediments related to patient engagement in healthcare practices, as well as to the effective management and control of diabetes (13). Self-care behaviors represent one of the most used concepts in this context, and their adherence and continuity are essential components of diabetes management (14). Considering the persistent and progressive nature of chronic diseases (15), research underscores the dual role of self-care in both managing the disease and promoting overall health (16). Conversely, adopting a compassionate attitude toward oneself as a coping mechanism is associated with the management of mental health disorders, more optimistic perceptions of one's illness and future, and the development of self-care behaviors (17). Given the significance of self-care experiences, researchers have increasingly focused on identifying protective factors that may attenuate the adverse effects associated with chronic conditions (18).

Self-compassion is a psychological factor that appears to play a role in influencing or decreasing health-oriented behaviors associated with self-care (19). Self-compassion is a psychological characteristic associated with positive outcomes such as psychological well-being, self-care, and HbA1c levels in individuals with diabetes (20). Characterized by attention and sensitivity to internal pain and suffering, along with a desire for healing, it is related to protection against psychological harm (19). Individuals with higher self-compassion tend to adjust to and regulate illness-related challenges by identifying appropriate solutions, thereby demonstrating good adaptability (20).

Self-compassion is linked to the regulation of negative emotions and the promotion of positive emotions. Hence, it is correlated with reduced patient distress and enhanced adherence to medical recommendations and health-related behaviors. Additionally, awareness of negative thoughts and emotions, combined with acceptance, empathetic understanding, and a compassionate stance toward the self, is associated with the attenuation of stressful situations and adverse effects and with the promotion of psychological equilibrium (19).

Given the chronic and self-managed nature of type 2 diabetes, abnormal HbA1c is not only a physiological challenge but also a potential source of psychological distress. Higher HbA1c levels can be associated with directly undermined psychological well-being and self-care behaviors by being linked to feelings of personal failure and diabetes-related distress (3, 12). In this context, self-compassion can be viewed as a critical emotional regulatory mechanism that may mitigate this associated pathway. By replacing self-critical judgment with a kind, balanced awareness of one's disease management struggles, self-compassion helps regulate the negative emotions and distress triggered by poor glycemic control (19, 20). This process preserves psychological well-being in the face of high HbA1c (3, 19) and fosters the motivational resilience necessary to sustain complex self-care behaviors (17, 20). Thus, self-compassion may act as a mediator not by eliminating objective disease challenges, but by providing the psychological resilience that buffers the adverse effects associated with HbA1c on key psychological and behavioral outcomes.

The escalating global burden of chronic conditions such as diabetes, characterized by rising incidence and prevalence rates, elevated mortality, and the increasing economic strain of healthcare costs associated with diabetic care, underscores the critical need to examine the psychological determinants influencing treatment adherence. This need is particularly salient given the substantial role psychological factors play in the onset, progression, and exacerbation of symptoms in individuals with type 2 diabetes. Behavioral, cognitive, and biological factors can significantly influence diabetes management, as indicated by the literature. This study aimed to explore the structural relationships between HbA1c levels, psychological well-being, and self-care behaviors among patients with type 2 diabetes, with self-compassion serving as a mediator.

Materials and Methods

This study employed a cross-sectional survey using structural equation modeling (SEM). The statistical population consisted of individuals diagnosed with type 2 diabetes residing in Rasht and Rezvanshahr (northern Iran) during 2020 and 2021 who had active medical records at diabetes-related laboratory and diagnostic centers, with

a minimum duration of six months since the initiation of their medical files. All patients were diagnosed with type 2 diabetes by an internal medicine specialist in accordance with ICD-10 criteria, with corroborating documentation in their medical records. The study sample comprised 368 individuals with type 2 diabetes, selected through purposive and consecutive sampling methods based on inclusion and exclusion criteria. Eligible participants were recruited until the required sample size was completed from two centers: a) Simorgh Specialized Diabetes Clinic in Rasht and b) a medical diagnostic laboratory in Rezvanshahr.

Inclusion and Exclusion Criteria

The inclusion criteria for the study required participants to possess literacy skills (i.e., the ability to read and write), be aged between 40 and 70 years, have a confirmed diagnosis of type 2 diabetes for a minimum duration of six months as determined by an internal medicine specialist, provide recent HbA1c measurements obtained within the preceding three months, and formally provide informed consent to participate in the research. The exclusion criteria included a prior history of receiving stress management counseling, refusal to participate in the assessments, and the presence of severe comorbid physical conditions, such as bone fractures, stroke, multiple sclerosis, and epilepsy. Additionally, candidates were excluded if they had disabling physical or neurological conditions, as indicated in their medical records, or if they exhibited severe co-occurring psychiatric disorders, including delusional disorders, schizophrenia, and bipolar disorder, as documented in their medical history.

Procedure

Following the selection of the sample, a demographic questionnaire, along with additional research instruments, was administered to the eligible participants for completion. Subsequently, the HbA1c levels were obtained from patient records stored in the medical center's database. Initially, the purpose and procedures of the assessments were clearly communicated to the patients and their accompanying individuals, with explicit assurances regarding the confidentiality and anonymity of their personal data. They were assured that their decision not to participate in the study would not impact their treatment process. HbA1c levels were measured for all patients within the past 3 months. In coordination with the relevant laboratories and after obtaining informed consent, blood samples for HbA1c testing were drawn at the medical diagnostic laboratory.

Data Collection Instruments

Summary of Diabetes Self-Care Activities (SDSCA)

The SDSCA, developed by Tobert and Glasgow in 1994,

was designed to assess the quality of patients' self-care behaviors over the preceding seven days (21). It comprises 15 items that examine diet adherence, exercise, blood glucose testing, foot care, and smoking. The total score on the SDSCA ranges from 0 to 105, with higher scores indicating a higher quality of self-care. Previous studies have reported a Cronbach's alpha of 0.89 for self-care in diabetic patients (22). The scale's content validity and internal reliability ($\alpha=0.77$) have been established in Iran (23).

Ryff's Scales of Psychological Well-being (RSPWB)

The RSPWB (1980) is a self-reported measure with a Likert scale that is organized into six subscales: self-acceptance, autonomy, environmental mastery, personal growth, positive relations with others, and purpose in life (24). This study employed an 18-item version. The total RSPWB score ranges from 18 to 108, with higher scores reflecting better psychological well-being. Ryff and Singer (2006) reported test reliability coefficients of 0.72 to 0.89 for well-being components, using Cronbach's alpha (25). Cronbach's alpha coefficients for various subscales of the RSPWB in the Iranian population range from 0.72 to 0.84 (26). Additionally, the dimensions of the RSPWB have been analyzed and validated through second-order confirmatory factor analysis. The findings indicate that the test's overall reliability is 0.76, whereas the subscale reliabilities range from 0.67 to 0.73 (27).

Self-Compassion Scale-Short Form (SCS-SF)

Raes, Pommier, Neff, and Van Gucht developed the 12-item SCS-SF in 2011 (28). This questionnaire includes six two-sided factors: self-kindness, self-judgment, common humanity, feeling of isolation, mindfulness, and over-identification. The scale employs a Likert format, with total scores ranging from 12 to 60, where higher scores reflect higher self-compassion (28). Cronbach's alpha for this scale has been reported as 0.86 in Thailand and Taiwan and 0.95 in the United States (29). The Cronbach's alpha coefficient for the overall scale in Iran has been reported to be 0.65 (30). Its content validity index was 0.83, as assessed by 10 faculty members from Birjand University of Medical Sciences in eastern Iran (31).

Glycosylated Hemoglobin (HbA1c) Test

HbA1c testing was conducted enzymatically in this study using a Hitachi 912 instrument (Japan), exclusively at a single laboratory. An HbA1c level below 5.7% is considered normal for individuals without diabetes. A value ranging from 5.7% to 6.4% is classified as 'prediabetes,' signifying an elevated risk of developing diabetes. For individuals previously diagnosed with diabetes, an HbA1c level of 5.6% is often considered a therapeutic target (32). HbA1c measurements were obtained from all participants within less than three months of the study.

Statistical Analyses

The data were analyzed using SEM with AMOS 24. The mediating relationships were analyzed using the bootstrap method with 5,000 resamples at a 95% confidence interval (CI) to test the indirect (mediating) pathways, as implemented in the Preacher and Hayes PROCESS macro (Version 2.0 BETA, March 31, 2009) (33). Model fit was evaluated using multiple fit indices with the following recommended thresholds: Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), and Incremental Fit Index (IFI) values greater than 0.90; Parsimonious Normed Fit Index (PNFI) and Parsimonious Comparative Fit Index (PCFI) values exceeding 0.50; Root Mean Square Error of Approximation (RMSEA) below 0.08; and Chi-square to degrees of freedom ratio (CMIN/df) less than 3 indicating good fit, with values up to 5 considered acceptable (34). In SEM, the R^2 index represents the proportion of explained variance (coefficients of determination), as measured by the endogenous latent variables. In this study, following Cohen's suggestions, R^2 values of 0.26, 0.13, and 0.02 were classified as strong, medium, and weak effect sizes, respectively, in structural equation modeling (35).

Prior to conducting SEM, several assumptions regarding data screening were examined. Univariate normality was assessed using skewness and kurtosis indices for all observed variables in the model. According to Kline (34), absolute skewness values below three and absolute kurtosis values below 10 indicate no significant deviation from univariate normality. All variables met these criteria, confirming the adequacy of the data. Multivariate normality was evaluated using Mardia's normalized multivariate kurtosis and its associated critical ratio. Following Blunch (36), a ratio below 5 indicates no severe violation of multivariate normality. In the present study, Mardia's coefficient was 4.734 with a critical ratio of 1.305—both well below the threshold—indicating that the multivariate normality assumption was satisfied. Additionally, multivariate outliers were identified using Mahalanobis distance (D^2); cases with $P < .05$ were considered outliers. A total of 47 outliers were detected and removed from the analysis. The assumption of multicollinearity was evaluated through tolerance and variance inflation factor indices. This analysis found no violations of the multicollinearity assumption, as indicated by the calculated tolerance and variance inflation factor values for the research variables. The final sample size for model fitting was 321 individuals; this number is considered suitable based on Kline's recommendations (34). Statistical analysis for SEM requires a minimum sample size of 200. Additionally, in the present study, CMIN/df values less than 5 and RMSEA values smaller than 0.10 were considered indicative of acceptable model fit (34).

Results

The study comprised 368 patients with type 2 diabetes.

The mean age of the patients was 56 ± 8.7 years (range, 40–70). Among the participants, 232 (63%) were female, and 270 (73.4%) reported being married. Moreover, 158 participants (42.9%) reported a history of diabetes lasting 6 to 10 years, while 156 participants (42.4%) indicated a familial history of diabetes (Table 1).

Table 2 presents the descriptive statistics and intercorrelations among the study variables. As shown, correlational analyses revealed statistically significant relationships among the primary variables. Specifically, higher HbA1c levels were associated with lower levels of self-compassion ($r = -0.740$, $P < .01$), reduced psychological well-being ($r = -0.658$, $P < .01$), and poorer self-care behaviors ($r = -0.608$, $P < .01$). In contrast, higher self-compassion was strongly associated with enhanced psychological well-being ($r = 0.760$, $P < .01$) and more frequent self-care behaviors ($r = 0.657$, $P < .01$).

This research employed SEM to assess model fit and determine the structural relationships among variables (Figure 1). The preliminary analysis of statistical assumptions indicated that SEM was appropriate for determining model fit, and maximum likelihood (ML) estimation was used to estimate the parameters. Table 3 presents the fit indices for the proposed and modified models across the entire sample of patients with type 2 diabetes. Step 1: The proposed model's fit was

Table 1. Demographic Characteristics of Patients with Type 2 Diabetes (N=368)

Variable	Category	n	%
Age (years)	40–50	118	32.0
	51–60	128	34.8
	> 60	122	33.2
Gender	Female	232	63.0
	Male	136	37.0
Education Level	Primary/Secondary	138	37.5
	High School Diploma	186	50.5
	University Degree	44	12.0
Duration of Diabetes (years)	< 5	103	27.0
	6–10	158	42.9
	> 10	107	29.1
Employment Status	Employed	111	30.2
	Housekeeper	182	49.5
	Retired	63	17.1
	Unemployed	8	2.1
	Disabled	4	1.1
Marital Status	Single	16	4.3
	Married	270	73.4
	Divorced	12	3.3
	Widowed	70	19.0
Family History of Diabetes	No	212	57.6
	Yes	156	42.4

evaluated before examining the structural coefficients. The fit of the proposed model was assessed using the fit indices introduced (Figure 1). Step 2: To improve the model in the first step, observed variables with factor loadings below 0.40 were removed (“self-judgment,” “autonomy,” “blood glucose testing,” “insulin injection and anti-diabetic pill consumption,” and “smoking”). Step 3: additionally, the non-significant structural paths in the model—specifically, the paths from HbA1c levels to psychological well-being and from HbA1c levels to self-care behaviors—were also removed (Figure 2). In step 4: the final research model was constructed by drawing correlations between errors (Figure 2). The results of the

fit indices indicate that after the modifications, the final model of the research has a good fit.

The coefficients of determination for psychological well-being and self-care behaviors in the modified structural model were 0.880 and 0.800, respectively. These values indicate that the exogenous and mediating variables, namely HbA1c levels and self-compassion, can predict 88% of the variance in psychological well-being and 80% of the variance in self-care behaviors among patients with type 2 diabetes, which is considered a strong effect. Likewise, the coefficient of determination for self-compassion was 70%, which is considered strong. Table 4 details the standardized path coefficients, while Figure 2

Table 2. Descriptive indices and correlation matrix between HbA1c levels, psychological well-being, self-care behaviors, and self-compassion (n=368)

Variables	Mean	SD	Range	Skewness	Kurtosis	1	2	3	4
1-HbA1c	8.73	1.94	6.10-15	0.883	-0.095	1			
2-Self-compassion	41.51	7.72	24-56	-0.232	-1.123	-0.740**	1		
3-Psychological well-being	75.48	7.27	59-101	0.465	0.074	-0.658**	0.760**	1	
4-Self-care behaviors	58.77	11.60	34-87	0.201	-0.502	-0.608**	0.657**	0.648**	1

** $P < 0.01$

Table 3. Goodness-of-fit indices of the proposed, modified, and final models in this research

Goodness-of-fit indices Model	χ^2	df	P-value	CMIN/df	RMSEA (CL _{90%})	PNFI	CFI	PCFI	IFI	GFI
Proposed model	495.094	148	<0.001	3.345	0.086 (0.07–0.09)	0.736	0.890	0.770	0.890	0.843
Modified model	325.834	75	<0.001	4.344	0.102 (0.09–0.11)	0.738	0.917	0.756	0.917	0.859
Final model	187.761	63	<0.001	2.980	0.078 (0.06–0.08)	0.648	0.955	0.661	0.956	0.921

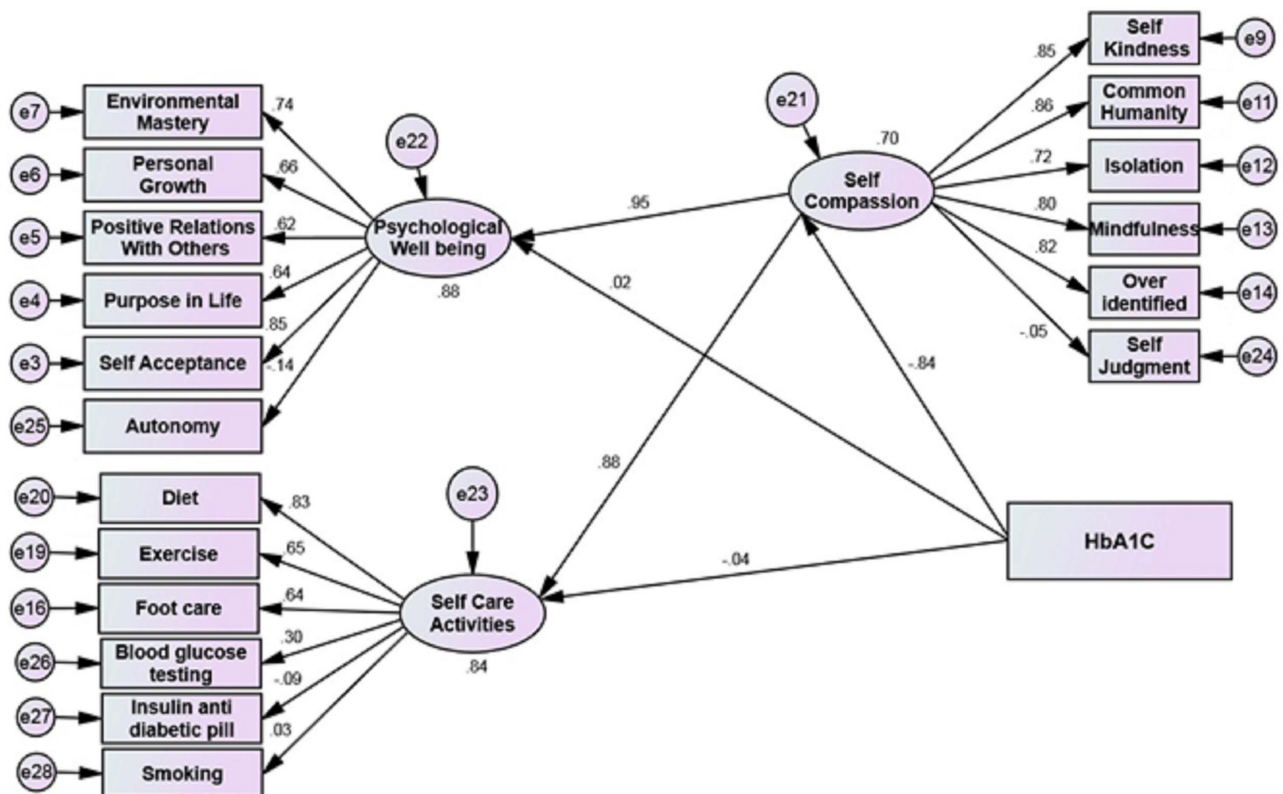


Figure 1. Standardized coefficients of the proposed structural model regarding the relationships between HbA1c levels, psychological well-being, and self-care behaviors, mediated by self-compassion

depicts the final research model.

Based on the estimated indices, the findings suggest that self-compassion mediates the structural relationship between HbA1c levels, psychological well-being, and self-care behaviors in patients with type 2 diabetes. Table 4 presents the results of the direct relationships among the research variables in the final model (Figure 2). It displays the standardized coefficients of all paths and the critical values in the final model.

The results of the direct relationships among the research variables in the final model (Figure 2) are presented in Table 4. Based on the standardized path coefficients, a distinct pattern of direct effects emerges. HbA1c levels demonstrated a significant, strong adverse direct effect on self-compassion ($\beta = -0.835$, $P < .001$). However, the direct effects of HbA1c levels on both psychological well-being ($\beta = 0.021$, $P = .768$) and self-

care behaviors ($\beta = -0.037$, $P = .717$) were non-significant. In contrast, self-compassion exhibited strong, significant positive direct effects on both psychological well-being ($\beta = 0.936$, $P < .001$) and self-care behaviors ($\beta = 0.892$, $P < .001$). These findings suggest that the influence of glycemic control (HbA1c) on the key psychological and behavioral outcomes is not direct, but instead appears to be fully channeled through its substantial impact on the level of self-compassion. The results of the mediation analysis to test the mediating (two indirect) pathway are presented in Table 5.

Based on the results, self-compassion serves as a mediator between HbA1c levels, psychological well-being ($P < 0.001$) (Table 5), and self-care behaviors ($P < 0.001$) (Table 5). More specifically, self-compassion reduces the relationship between HbA1c levels and psychological well-being by -0.4946 units and between HbA1c levels and

Table 4. Standardized coefficients of the final model paths (modified)

Paths	Standardized coefficients	Standard error	Critical ratio	P-Value
HbA1c levels → Self-compassion	-0.835	0.029	-19.673	<0.001
HbA1c levels → Psychological well-being	0.021	0.067	0.294	0.768
HbA1c levels → Self-care behaviors	-0.037	0.001	-0.362	0.717
Self-compassion → Psychological well-being	0.936	0.074	17.800	<0.001
Self-compassion → Self-care behaviors	0.892	0.054	11.428	<0.001

Table 5. Bootstrap results for indirect paths from HbA1c to psychological well-being and self-care mediated by self-compassion

Paths	Indices						P-Value
	Data	boot	Bias	Error	Lower bound	Upper bound	
HbA1c levels and psychological well-being through self-compassion	-0.4942	-0.4946	-0.0004	0.0386	-0.5740	-0.4210	<0.001
HbA1c levels to self-care behaviors through self-compassion	-0.3822	-0.3833	-0.0011	0.0481	-0.4811	-0.2916	<0.001

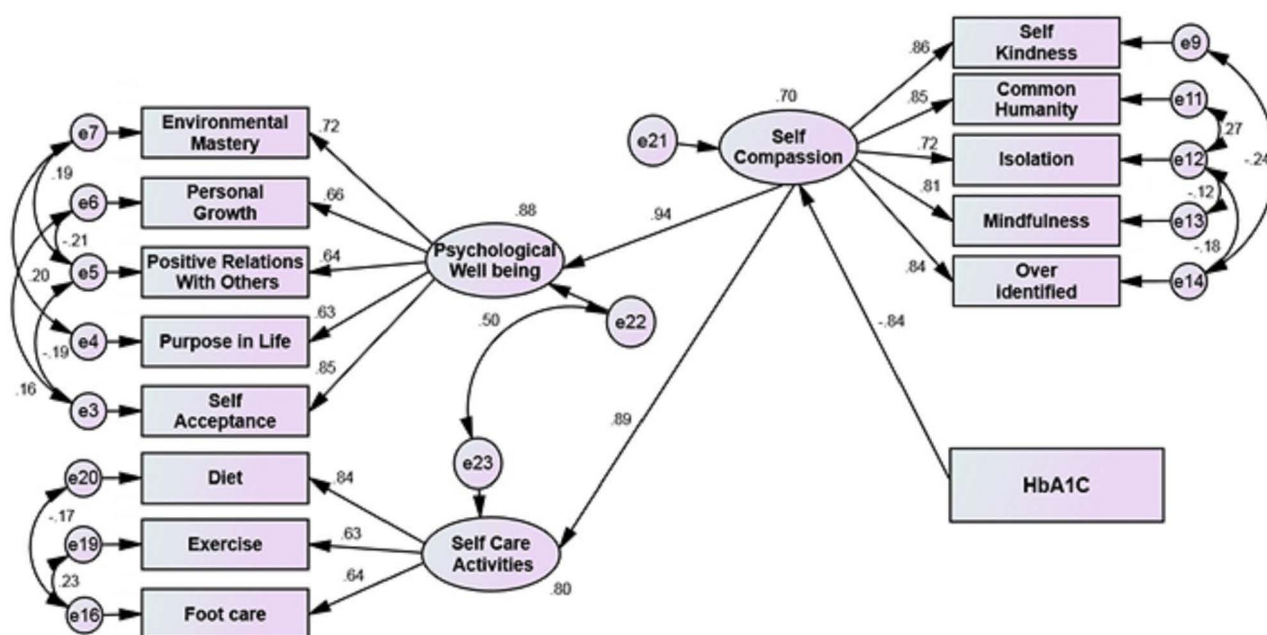


Figure 2. Standardized coefficients of the modified final structural model regarding the relationships between HbA1c levels, psychological well-being, and self-care behaviors, mediated by self-compassion

self-care behaviors by -0.3833 units.

Discussion

This study aimed to examine the structural relationships between HbA1c levels, psychological well-being, and self-care behaviors, with self-compassion serving as a mediator in patients with type 2 diabetes. The findings indicate that self-compassion mediates the relationship between HbA1C levels and psychological well-being. Self-compassion mitigates the negative impact of HbA1c on the psychological well-being of diabetic patients. Consistent with prior research (37), self-compassion mitigates the adverse effects of elevated HbA1c levels on psychological well-being.

The findings of this study align with prior research, demonstrating that self-compassion is positively and directly associated with enhanced psychological well-being (29,30). Furthermore, 88% of the variance in psychological well-being is accounted for by the relationship between HbA1c levels and self-compassion. This finding suggests that self-compassion is a psychological construct associated with a spectrum of positive mental and physical outcomes among adults with diabetes (37) and reflects the extent of acceptance of undesirable aspects of oneself and one's life (29). Self-compassion requires individuals to demonstrate self-kindness rather than engage in excessive self-criticism. Individuals with a positive self-perception tend to exhibit greater optimism, which can enhance their motivation and capacity to confront health-related issues. Consequently, they may experience reduced stress and fewer negative thoughts regarding themselves and their conditions (19). In other words, improved psychological well-being strengthens the immune system and influences stress hormones by breaking the depression cycle and the resulting blood glucose irregularities. These factors contribute to the stabilization of HbA1c levels over time.

Due to its chronic nature, diabetes causes prolonged elevations in stress hormones, including cortisol, epinephrine, glucagon, and growth hormone. A significant consequence of this hormonal elevation is the irregularity observed in HbA1c levels. Consistent with previous research, this study found a direct correlation between self-compassion and health-related behaviors, as well as improved health outcomes among patients with diabetes (3,19,20). By enhancing well-being, self-compassion encourages patients to prioritize self-care.

Consistent with prior research, the present study found a positive association between self-compassion and self-care behaviors (3,20). In other words, according to behavioral outcomes, individuals with higher levels of self-compassion were more likely to consume healthy foods and engage in physical activity on more days of the week (3). Financial constraints, inadequate knowledge of self-care practices, the absence of standardized protocols for guiding diabetic patients, challenges in patient-

provider interactions, limited understanding of healthy lifestyle practices, difficulties in relinquishing unhealthy habits, low self-confidence, reduced self-esteem and self-efficacy, time constraints, professional barriers, feelings of hopelessness, and lack of patient motivation represent substantial barriers to the effective implementation of self-care. Research indicates that the low average of diabetes-related self-care activities and their dimensions reflects a deficiency in knowledge and education (14). Chronic diabetic patients can learn from daily life experiences and from expert health professionals during follow-up visits. Patients with low education levels and those newly diagnosed with diabetes require targeted education and attention due to potential gaps in their understanding of the disease and self-care practices (5).

It can be inferred that the psychological appropriateness of a situation for people with diabetes correlates with their closeness to a controlled HbA1c state. In this context, self-compassion enhances self-awareness and, in turn, promotes health-related behaviors, thereby supporting physical and mental health and reducing blood sugar levels (17). The findings of this study align with previous research, revealing a significant negative association between HbA1c levels and both self-compassion (2,38). Furthermore, unrecognized attitudes or factors may significantly influence behaviors associated with blood glucose regulation and HbA1c levels (8). Self-compassion is a significant factor in explaining these results, as it contributes to a more adaptive and flexible response to unavoidable medical challenges and health issues among individuals with diabetes (37). In other words, self-compassion appears to be a key component of the emotion regulation system(3). Hence, People can face and manage difficult emotions with greater acceptance and understanding more effectively, which can be achieved by activating the security and relief systems. As a result, patients with greater self-compassion will be better able to control their negative emotions and have a greater tolerance for distress.

The findings also revealed that self-compassion mediates the relationship between HbA1c levels and self-care behavior. This suggests that self-compassion can mitigate the destructive effects of HbA1c on these behaviors. High HbA1c levels are associated with greater impairment in self-care behaviors; however, the strength of this association decreases substantially when self-compassion is included. Given this finding, low self-compassion may be one mechanism by which HbA1c adversely affects self-care behavior. Diabetes self-care emphasizes the importance of self-compassion, which can help explain this finding. A high locus of control and knowledge may motivate the maintenance of self-care behaviors. However, in the event of an unavoidable hypoglycemia or a health complication resulting from diabetes, this sense of responsibility may lead to self-blame

and criticism (37). In other words, self-compassion fosters a revised perception of the patient's challenges, facilitating the acceptance of pain and suffering, acknowledgment of the individual's present condition, and the enhancement of self-care behaviors through adherence to appropriate dietary practices, commitment to treatment regimens, and the promotion of a healthier lifestyle (20).

The study found that self-compassion mediates the relationship between HbA1c levels, psychological well-being, and self-care behaviors. This role exists because individuals with high self-compassion strive to avoid pain. Active coping mechanisms thus arise to support and preserve psychological health. Self-compassionate individuals exhibit more positive self-perceptions and report fewer perceived imperfections and pain than their peers. Consequently, they develop fewer symptoms of anxiety and depression and engage in more self-care activities. Consequently, self-compassion represents an ideal and cost-effective intervention target for improving mental and physical health. Stated differently, persons with diabetes who properly control their blood glucose levels by early detection of disease complications, continuous follow-up with medical services, and observe a good diet and physical activity will have better mental and physical health. Despite the aforementioned findings, there is no universally accepted standard for assessing HbA1c variability, and interpreting its results remains challenging in clinical settings. This makes it difficult to evaluate the clinical relevance of results based on these measures. Consequently, rather than focusing solely on HbA1c levels, it is recommended that healthcare professionals prioritize the education and enhancement of their patients' mental health.

This study has several limitations. First, its cross-sectional design precludes causal inferences regarding the observed relationships. Second, data were collected via self-report measures, which may introduce social desirability or recall bias. Third, the sample was drawn from northern Iran using non-random sampling, limiting generalizability to other populations. Finally, unmeasured confounding variables (e.g., socioeconomic status, diabetes complications, or medication adherence) may influence the proposed pathways.

Conclusion

Self-compassion mediates the relationship between HbA1c levels and both psychological well-being and self-care behaviors in adults with type 2 diabetes, highlighting its role as a protective psychological resource. Integrating self-compassion training into diabetes care may enhance mental health and promote adaptive self-management behaviors.

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Competing Interests

The author declares no conflict of interest.

Disclosure Statement

No financial interest or benefit was derived from the application of this research.

Ethical Approval

To comply with ethical protocols, the research proposal was approved by the Ethics Committee for Biomedical Research at the Islamic Azad University – Rasht Branch under the approval code IR.IAU.RASHT.REC.1400.002. Participation in interviews and completion of the questionnaires were considered as indications of informed consent. All instructions were clearly communicated in the questionnaire guidelines. The confidentiality of the collected information was strictly maintained, and participants were informed of their right to withdraw from the study at any stage. The results were reported in a manner that preserved participants' anonymity.

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References

1. Møllergård E, Johnsson P, Eek F. Sociodemographic factors associated with HbA1c variability in type 2 diabetes: a prospective exploratory cohort study. *BMC Endocr Disord*. 2020;20(1):102. doi: [10.1186/s12902-020-00585-6](https://doi.org/10.1186/s12902-020-00585-6)
2. Kokoszka A, Pacura A, Kostecka B, Lloyd CE, Sartorius N. Body self-esteem is related to subjective well-being, severity of depressive symptoms, BMI, glycated hemoglobin levels, and diabetes-related distress in type 2 diabetes. *PLoS One*. 2022;17(2):e0263766. doi: [10.1371/journal.pone.0263766](https://doi.org/10.1371/journal.pone.0263766)
3. Ventura AD, Nefs G, Browne JL, Friis AM, Pouwer F, Speight J. Is self-compassion related to behavioural, clinical and emotional outcomes in adults with diabetes? Results from the second diabetes MILES—Australia (MILES-2) study. *Mindfulness* (N Y). 2019;10(7):1222-31. doi: [10.1007/s12671-018-1067-0](https://doi.org/10.1007/s12671-018-1067-0)
4. Huai-Ching Liu IT, Uchida Y, Joo E, Mano-Usui F, Okura M, Chishima Y, et al. Psychosocial Factors Associated with Well-Being and HbA1c of People with Diabetes in Japan: A Structural Equation Model. *Japanese Psychological Research*. 2025;67(4):464-76. doi:[10.1111/jpr.12464](https://doi.org/10.1111/jpr.12464)
5. Gurmu Y, Gela D, Aga F. Factors associated with self-care practice among adult diabetes patients in West Shoa Zone, Oromia regional state, Ethiopia. *BMC Health Serv Res*. 2018;18(1):732. doi: [10.1186/s12913-018-3448-4](https://doi.org/10.1186/s12913-018-3448-4)
6. Ayoubi J, Bigdeli I, Mashhadi A. The effect of mindfulness-integrated cognitive behavior therapy on quality of life, psychological distress and adherence in patients with type 2 diabetes mellitus. *Quarterly Journal of Health Psychology*. 2020;9(34):75-94. [Persian].
7. Massey CN, Feig EH, Duque-Serrano L, Wexler D, Moskowitz JT, Huffman JC. Well-being interventions for individuals with diabetes: a systematic review. *Diabetes Res Clin Pract*.

- 2019;147:118-33. doi: [10.1016/j.diabres.2018.11.014](https://doi.org/10.1016/j.diabres.2018.11.014)
8. Wang X, Tian B, Zhang S, Zhang J, Yang W, Li J, et al. Diabetes knowledge predicts HbA1c levels of people with type 2 diabetes mellitus in rural China: a ten-month follow-up study. *Sci Rep*. 2023;13(1):18248. doi: [10.1038/s41598-023-45312-y](https://doi.org/10.1038/s41598-023-45312-y)
9. Huai-Ching Liu IT, Uchida Y, Joo E, Mano-Usui F, Okura M, Chishima Y, et al. Psychosocial factors associated with well-being and HbA1c of people with diabetes in Japan: a structural equation model. *Jpn Psychol Res*. 2025;67(4):464-76. doi: [10.1111/jpr.12464](https://doi.org/10.1111/jpr.12464)
10. Ryff CD, Singer BH, Dienberg Love G. Positive health: connecting well-being with biology. *Philos Trans R Soc Lond B Biol Sci*. 2004;359(1449):1383-94. doi: [10.1098/rstb.2004.1521](https://doi.org/10.1098/rstb.2004.1521)
11. Assarzadegan M, Raeisi Z. Effectiveness of positive psychology training on psychological well-being and its dimensions among patients with type II diabetes. *J Diabetes Nurs*. 2019;7(2):793-808.
12. Davies M. Psychological aspects of diabetes management. *Medicine (Abingdon)*. 2019;47(2):131-4. doi: [10.1016/j.mpmed.2018.11.003](https://doi.org/10.1016/j.mpmed.2018.11.003)
13. Paduch A, Kuske S, Schiereck T, Droste S, Loerbroks A, Sørensen M, et al. Psychosocial barriers to healthcare use among individuals with diabetes mellitus: a systematic review. *Prim Care Diabetes*. 2017;11(6):495-514. doi: [10.1016/j.pcd.2017.07.009](https://doi.org/10.1016/j.pcd.2017.07.009)
14. Khosravizadeh O, Ahadinezhad B, Maleki A, Yousefy S, Momeni Z. Diabetes self-care activities among patients with type 2 diabetes: a systematic review and meta-analysis. *Int J Diabetes Dev Ctries*. 2024;44(1):10-9. doi: [10.1007/s13410-023-01214-3](https://doi.org/10.1007/s13410-023-01214-3)
15. Jin Y, Bhattarai M, Kuo WC, Bratzke LC. Relationship between resilience and self-care in people with chronic conditions: a systematic review and meta-analysis. *J Clin Nurs*. 2023;32(9-10):2041-55. doi: [10.1111/jocn.16258](https://doi.org/10.1111/jocn.16258)
16. Riegel B, Barbaranelli C, Sethares KA, Daus M, Moser DK, Miller JL, et al. Development and initial testing of the self-care of chronic illness inventory. *J Adv Nurs*. 2018;74(10):2465-76. doi: [10.1111/jan.13775](https://doi.org/10.1111/jan.13775)
17. Kazemi A, Ahadi H, Nejat H. Effectiveness of compassion focused therapy on loneliness, self-care behaviors and blood sugar in diabetes patients. *Iran J Rehabil Res Nurs*. 2020;6(3):42-9.
18. Babić R, Babić M, Rastović P, Ćurlin M, Šimić J, Mandić K, et al. Resilience in health and illness. *Psychiatr Danub*. 2020;32(Suppl 2):226-32.
19. Heydari Aghdam B, Khademi A, Zahedi R. Prediction of self-care behaviors based on self-compassion and health locus of control among diabetic patients. *Nurs Midwifery J*. 2021;18(12):977-85.
20. Hajigadizadeh A, Taheri A, Babakhani N. Comparing the effectiveness of cognitive rehabilitation and compassion-based therapy on self-care behaviors of the elderly with mild cognitive impairment. *Iran J Rehabil Res Nurs*. 2023;9(4):75-87. doi: [10.22034/ijrn.9.4.8](https://doi.org/10.22034/ijrn.9.4.8)
21. Toobert DJ, Glasgow RE. Assessing diabetes self-management and outcome expectations: impact on self-care behaviors questionnaire. In: Bradley C, ed. *Handbook of Psychology and Diabetes*. Routledge; 1994. p. 351-75.
22. Zareban I, Niknami S, Hidarnia A, Rakhshani F, Karimy M, Kuhpayehzadeh J, et al. Predictors of self-care behavior and its effective factors among women's with type 2 diabetes patient in Zahedan via health belief model. *J Health Syst Res*. 2014;9(14):1797-18805.
23. Gasemi N, Namdari K, Goreishian M, Amini M. Relationship between expectationism and adherence to self-care behaviors among patient with type 2 diabetes. *Clinical Psychology and Personality*. 2010;17(43):43-53.
24. Ryff CD. Psychological well-being in adult life. *Curr Dir Psychol Sci*. 1995;4(4):99-104. doi: [10.1111/1467-8721.ep10772395](https://doi.org/10.1111/1467-8721.ep10772395)
25. Ryff CD, Singer BH. Best news yet on the six-factor model of well-being. *Soc Sci Res*. 2006;35(4):1103-19. doi: [10.1016/j.ssresearch.2006.01.002](https://doi.org/10.1016/j.ssresearch.2006.01.002)
26. Karimi K, Kavousian J, Karamati H, Arabzadeh M, Ramezani V. Structural model of perfectionism, academic motivation and psychological well-being in high school students. *J Appl Psychol*. 2016;10(3):311-27.
27. Ahmadpour M, Borjali A, Eskandari H, Farrokhi N. Designing and testing a model psychological well-being according to personality traits with as mediator ethnic identity at Talesh. *Clinical Psychology and Personality*. 2018;16(1):105-18.
28. Raes F, Pommier E, Neff KD, Van Gucht D. Construction and factorial validation of a short form of the self-compassion scale. *Clin Psychol Psychother*. 2011;18(3):250-5. doi: [10.1002/cpp.702](https://doi.org/10.1002/cpp.702)
29. Neff KD, Germer CK. A pilot study and randomized controlled trial of the mindful self-compassion program. *J Clin Psychol*. 2013;69(1):28-44. doi: [10.1002/jclp.21923](https://doi.org/10.1002/jclp.21923)
30. Varae P, Momeni K, Moradi A. The prediction of psychological well-being based on religiosity and self-compassion in the elderly. *Aging Psychol*. 2017;3(1):45-54.
31. Mohammady S, Borhani F, Roshanzadeh M. Self-compassion in critical care nurses. *Quarterly Journal of Nursing Management*. 2016;5(2):44-50. doi: [10.29252/ijnv.5.2.44](https://doi.org/10.29252/ijnv.5.2.44)
32. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes-2020. *Diabetes Care*. 2020;43(Suppl 1):S14-31. doi: [10.2337/dc20-S002](https://doi.org/10.2337/dc20-S002)
33. Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods*. 2008;40(3):879-91. doi: [10.3758/brm.40.3.879](https://doi.org/10.3758/brm.40.3.879)
34. Kline RB. *Principles and Practice of Structural Equation Modeling*. 4th ed. New York: Guilford Publications; 2016.
35. Cohen J. Statistical power analysis. *Curr Dir Psychol Sci*. 1992;1(3):98-101. doi: [10.1111/1467-8721.ep10768783](https://doi.org/10.1111/1467-8721.ep10768783)
36. Blunch NJ. *Introduction to Structural Equation Modeling Using IBM SPSS Statistics and AMOS*. SAGE Publications Ltd; 2012. p. 24-32.
37. Ferrari M, Dal Cin M, Steele M. Self-compassion is associated with optimum self-care behaviour, medical outcomes and psychological well-being in a cross-sectional sample of adults with diabetes. *Diabet Med*. 2017;34(11):1546-53. doi: [10.1111/dme.13451](https://doi.org/10.1111/dme.13451)
38. Ting Huai-Ching Liu; Yukiko Uchida; Erina Joo; Fumika Mano-Usui; Mizuyo Okura; Yuta Chishima; Kaori Ikeda; Nobuya Inagaki Japanese Psychological Research. 2023; 67(4): 464-476. doi: [10.15090/00013730](https://doi.org/10.15090/00013730)