Predictors of dietary self-efficacy in high glycosylated hemoglobin A1c type 2 diabetic patients

**Tamás Köbling[1], Zita Váradi[1], Éva Katona[1],
Sándor Somodi[2], Péter Kempler[3],
Dénes Páll[1,4] and Miklós Zrínyi[4]** ⓘ

Abstract

Objective: To predict dietary self-efficacy behaviors in high glycosylated hemoglobin A1c (HbA1c) patients using type D personality (TDP) and other psychosocial measures.

Methods: A cross-sectional, predictive research design was implemented. Participants were type 2 diabetes mellitus patients diagnosed more than 2 years prior to the study. Data were collected for demographics, dietary self-efficacy and psychological measures. Spearman's rank-order correlation was used to test for relationships, the Mann–Whitney test was used to test for differences and multiple linear regression was used to examine predictors of dietary self-efficacy.

Results: Lower dietary self-efficacy was strongly correlated with greater social isolation ($r = 0.93$) and moderately correlated with more mental health problems ($r = 0.20$) and higher TDP scores ($r = 0.17$). Higher HbA1c was inversely related to self-reported physical health ($r = -0.19$). Social and emotional isolation and time since diagnosis predicted dietary self-efficacy (greater isolation was associated with more dietary management difficulties).

Conclusions: Regression outcomes suggested that a 10% decrease in social isolation improves dietary self-efficacy by 30%, a significant boost to therapeutic adherence. We recommend assessment of social isolation to improve dietary self-efficacy and achieve better patient adherence to therapy.

[1]Department of Medicine, University of Debrecen, Debrecen, Hungary
[2]Emergency Clinic, University of Debrecen, Debrecen, Hungary
[3]Department of Medicine, Semmelweis University, Budapest, Hungary
[4]Coordination Center for Drug Development, University of Debrecen, Debrecen, Hungary

Corresponding author:
Miklós Zrínyi, Coordination Center for Drug Development, University of Debrecen, H-4032 Debrecen, Nagyerdei blvd. 98, Hungary.
Email: zrinyi1969@gmail.com

Introduction

Dietary adherence, an important patient behavior that is strongly linked to better survival on diabetes treatment, has long been associated with personal confidence in self-management, specifically dietary self-confidence. Self-efficacy is defined as an individual's confidence in being able to carry out a behavior, and has been reported to improve dietary and glycemic control.[1] Greater self-efficacy is associated with reduced fat intake, lower body mass index (BMI) and lower glycosylated hemoglobin A1c (HbA1c).[1] However, Mohebi et al.[2] showed that self-efficacy is generally low in patients with type 2 diabetes mellitus (T2DM) and that self-efficacy is a good predictor of self-care behaviors in this population. One study used structural equation modeling to demonstrate that self-efficacy and autonomous self-regulation are associated with dietary adherence in diabetes patients;[3] self-efficacy positively affected dietary adherence, whereas self-regulation was associated more with life satisfaction. In a longitudinal study of patients with T2DM, dietary self-care was associated with self-efficacy, self-evaluation and autonomous motivation, but not with controlled motivation,[4] and there was some evidence that dietary self-care predicted changes in HbA1c. In another study of dietary self-care behaviors among patients with T2DM, greater self-efficacy, better understanding and a better attitude toward diabetes were associated with performing more of the expected dietary self-care behaviors.[5] Diabetes-related self-efficacy shows a strong association with better glycemic control, improved medication adherence and blood sugar self-testing, and increased diabetes knowledge, as well as physical exercise.[6]

Patients who have high self-efficacy make substantial efforts that, if well executed, lead to successful adherence and treatment survival.[7] However, patients with low self-efficacy are likely to give up on further effort early and fail to manage their conditions. Having type D personality (TDP) may be one reason for some patients having low or very low self-efficacy.[8] TDP (the 'D' stands for 'distressed'), is characterized by negative affectivity (e.g. worry, irritability and gloom) and social inhibition (e.g. lack of self-assurance and personal confidence).[8] Individuals with TDP tend not to share emotions with others because of fear of rejection or disapproval. The prevalence of TDP is approximately 20% in the general population[9] but higher in cardiovascular patients (range 23.4% to 26.9%).[10] TDP has been investigated in various patient groups and shows a strong association with acute coronary syndrome;[11] it is also a strong predictor of cardiovascular morbidity.[12] One study showed that in-stent restenosis was also higher in TDP coronary artery disease patients treated with drug-eluting stent.[13]

TDP is prevalent in diabetic patients and is a significant predictor of both poor medication adherence and unhealthy behaviors.[14] Li et al.[15] observed that patients with T2DM and with TDP have significantly worse glycemic control (higher HbA1c levels) than those without TDP. TDP is also associated with greater levels of

loneliness in diabetic patients.[16] Loneliness negatively affects coping and self-management; the latter is responsible for poor clinical and therapeutic outcomes.[17] Li and colleagues demonstrated that patients with TDP were significantly more likely to have poor medication adherence than those without TDP.[17] TDP diabetic patients are also less compliant in attending check-ups with their primary care physician.[18] Nefs et al. did not find a direct link between laboratory indicators and TDP, but reported more complications regarding medication use, diabetes-specific social anxiety, greater loneliness and symptoms of depression.[19] Despite growing interest in TDP research, there are few if any studies on the effect of TDP on diabetes adherence. In terms of dietary self-efficacy and TDP, Shao et al.[20] showed lower levels of general self-efficacy in patients identified as having TDP.[20] HbA1c levels were also significantly higher in patients with T2DM and TDP than in patients without TDP. However, there is a lack of studies focusing on high HbA1c (i.e. less adherent) patients in relation to specific dietary self-efficacy and TDP. In conclusion, the previous research cited above shows that TDP negatively affects clinical outcomes. Although TDP is not always associated with laboratory indicators of diabetes treatment, it has a strong influence on patient behaviors and therapeutic adherence. The studies cited here indicate that individuals with TDP are less likely to follow a healthy diet or consult healthcare professionals for diabetes management issues. Although dietary efficacy emerges as a variable that positively affects diabetes self-care behaviors and clinical outcomes, it has been under-researched in relation to TDP in diabetic patients. Therefore, the aim of the current study was to predict dietary self-efficacy behaviors using TDP and other psychosocial measures in high HbA1c patients.

Methods

This investigation used a cross-sectional, prospective, correlational research design. The research was implemented over a 3-month period starting in May 2019. The study site was the outpatient diabetes unit of the Department of Medicine, University of Debrecen, Hungary. Ethical approval was sought before implementation from the National Medical Research Council. Patients were approached on the day of their regular medical check-up and invited to participate. Patients provided written informed consent before beginning the study. Medical students were trained to provide support with data collection and to help patients to complete the research instruments (by clarifying the wording of items, if necessary). Data collection was paper based, and anonymity was maintained throughout the entire research process. Patients filled out the research instruments before seeing their physician for their check-up and were required to complete all the instruments in one session. Two administrative personnel were employed to help with data entry; these personnel also ensured data quality by systematically cross-checking the final data.

Sample

The pool of potential participants was determined using the University of Debrecen electronic hospital records. An initial pool of more than 1000 eligible outpatients was identified, out of which 250 outpatients were randomly selected and approached. Inclusion criteria were confirmed diagnosis of T2DM at least 2 years prior to the study launch, overweight or obesity (BMI: 25–45 kg/m^2), age range 35 to 70 years and ability/willingness to respond to a set of research instruments. We made no specific attempt to balance the age or sex distribution of our sample. A priori sample size

calculations showed that with a level of significance set at 5%, statistical power set at 0.8 (20% type II error), effect size set at medium (0.15) and six predictor variables considered, 98 subjects were required to ensure sufficient statistical power for the study outcomes.[21] For the regression analysis, a subsample of patients with HbA1c ≥7.0 was selected.

Instruments

Two of the study instruments were translated into Hungarian; two had already been used in health research in Hungary. The translation was carried out by personnel who held a BA in English. Back-translation and corrections were carried out by medical personnel who were involved in diabetic patient care but not involved in this research. The study investigators compared the final translated instruments to the original ones and approved the translated instruments. A pilot number (10) of instruments were distributed to patients to evaluate validity and reliability before full implementation. Reliability coefficients (r) for each scale item were obtained. When individual item reliability fell below 0.7, we checked the wording of the item statement because we suspected that coefficients with reliability lower than the level conventionally accepted (Cronbach's alpha >0.7) might have been caused by incorrect wording/translation of the original statement. Items that required correction for translation were revised before final implementation. To ensure validity, the validated Hungarian versions of the scales were used (i.e. the Type D Personality Scale and Health Survey Short Form 36), where available. The choice of additional instruments was based on a review by a medical expert, who approved the suitability of the instruments for the study purposes (dietary efficacy and emotional/social loneliness scales). We also developed and used a set of sociodemographic items. Self-report scales were used to rate physical activity and compliance with dietary recommendations (score range 1–10: 1 'never' and 10 'all the time').

Dietary self-efficacy was assessed using the Dietary Self-Efficacy Scale (ESES).[22] The ESES is a 25-item instrument that assesses an individual's self-efficacy regarding dietary behavior. Perception of dietary self-efficacy is an important influence on dieting and weight loss success. The ESES has two factors, dietary difficulties as a function of negative affect and as a function of socially acceptable circumstances. Items are scored on a 7-point Likert scale (1 = no difficulty eating; 7 = most difficulty eating); minimum and maximum scores were 25 and 175, respectively. Higher scores indicate less belief in the ability to self-regulate dietary behaviors. The ESES has shown a reliability of 0.92 in previous research and the reliability was 0.96 in the current investigation.

Emotional and social loneliness was determined using the Emotional/Social Loneliness Inventory (ESLI).[22] This is a 15-item instrument that measures loneliness and social isolation. The ESLI has four factors that differentiate emotional/social loneliness and emotional/social isolation. Higher scores on the instrument indicate greater loneliness or isolation. Items are scored on a 4-point Likert scale (0 = rarely true; 3 = usually true); scores range between 0 and 45. Previous studies have reported reliability in the range of 0.80–0.86; the reliability in this study was 0.92.

Type D personality was assessed using the Type D Personality Scale Hungarian version.[23] The scale measures two constructs: negative affectivity and social inhibition. Negative affectivity is the tendency to experience negative emotions. Social inhibition is the tendency to inhibit self-expression in social interactions. The original scale developed by Denollet comprised 14 items.[9] Pruebl et al.[23] tested the scale on 12,653 participants in Hungary and reduced the scale to 10 items to ensure its cultural

validity. Therefore, the 10-item scale was used in this research. Items are scored on a 4-point Likert scale (0 = not characteristic; 3 = very characteristic); the possible total score range is 0 to 30. Higher scores on the scale indicate greater negative affectivity and greater social inhibition. Reliability for the Hungarian sample was 0.87 (negative affectivity) and 0.84 (social inhibition); the reliability in the present study was 0.86 for negative affectivity, 0.83 for social inhibition and 0.87 for the full scale.

Finally, quality of life was determined using the Health Survey Short Form 36 (SF36).[22] The scale measures perceived health and mental health. The instrument produces two composite scores: a physical health total score and a mental health total score, which reflect physical and mental health functioning, respectively. The short form scale is a 36-item measure on which higher scores indicate worse physical and mental health functioning (total score range 0–100). Previous research has reported reliabilities of 0.93 for physical functioning and 0.88 for mental functioning; the reliability in the present study was 0.76 for physical functioning and 0.73 for mental functioning.

Statistical analyses

Descriptive statistics were used to describe the sample characteristics. Data normality was assessed using one-sample Kolmogorov–Smirnov tests. Cronbach's alpha coefficient was calculated and used to evaluate the reliability of the measures. No specific statistical treatment was used to replace missing data; instead, cases with missing data were excluded from subsequent analyses. Owing to non-normal distributions, Spearman's rank-order correlation was used to examine correlations and Mann–Whitney tests used to investigate group differences. A multiple regression model was used to predict

dietary self-efficacy. As the assumption of multivariate normality is a condition of regression, data transformations and removal of outliers may help to develop an unbiased regression model.[24] To correct for skewness, log10 transformations were applied before running the regression analysis and outliers with ±2.0 or more standardized residuals were removed from the final analysis. The significance level was set at 5% and one-tailed tests were used where applicable. All analyses were run using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA).

Results

Of the 250 randomly selected participants, 178 subjects agreed to participate, resulting in a response rate of 71.2%. The mean age was 59.2 (standard deviation [SD] 13.6) years and women slightly dominated the sample (56.8%) (Table 1). A total of 24.1% of participants did not live with a partner and 22.4% held a postgraduate degree. The mean BMI was 32.3 (SD 4.08) kg/m^2 and the mean duration of diabetes diagnosis was 10.2 (SD 6.8) years. Regarding diabetes management, 2.7% of participants reported receiving only non-pharmacological treatment, 62.4% were taking non-insulin type antidiabetics, 16.1% were receiving insulin therapy and 18.8% receiving combined treatment. The average HbA1c was 7.46% (SD 1.46) and the average fasting glucose level was 8.66 (SD 3.21) mmol/l.

The mean self-reported physical activity was 6.6 (SD 2.6) and the mean score for compliance with dietary recommendations was 6.9 (SD 2.1). By definition (cutoff value ≥10), 24.8% of patients were classified as having TDP on the negative affect measure and 29.8% on the social isolation measure.

Table 2 shows descriptive statistics for the main measures. Regarding the main measures of interest, subjects reported low

Table 1. Patient characteristics (N = 178).

	Mean	SD	Minimum	Maximum	%
BMI (kg/m^2)	32.3	4.08	25.1	44.2	
HbA1c (%)	7.46	1.5	5.4	12.7	
Fasting glucose (mmol/l)	8.66	3.2	3.8	20.5	
Therapy type					
Non-pharmacological					2.7
Non-insulin type					62.4
Insulin					16.1
Combined					18.8
Age (years)	59.2	13.6	35	70	
Time since diagnosis (years)	10.2	6.8	2	30	
Sex					
Female					56.8
Male					43.2
Cohabitation					
Yes					75.9
No					24.1
Highest degree					
Undergraduate					20.1
Graduate					57.5
Postgraduate					22.4
Dietary compliance*	6.9	2.1	1	10	
Exercise*	6.6	2.6	1	10	

*Self-reported, on a scale of 1–10 (1 = never, 10 = all the time). HbA1c: glycosylated hemoglobin A1c; BMI: body mass index; SD: standard deviation.

Table 2. Descriptive statistics for main psychometric measures.

	Mean	SD	Minimum	Maximum
ESES (negative affect)	29.27	20.34	14	98
ESES (social affect)	30.75	14.43	10	70
ESES total score	62.23	32.54	25	175
ESLI (social loneliness)	6.01	5.21	0	24
ESLI (emotional loneliness)	5.30	5.07	0	24
ESLI (social isolation)	16.16	9.50	7	49
ESLI (emotional isolation)	4.66	4.59	0	21
SF36 (physical health)	49.86	7.65	29	63
SF36 (mental health)	35.43	7.81	21	63
SF36 total score	85.29	7.74	67	100
Type D (negative affect)	6.28	4.16	0	19
Type D (social inhibition)	8.15	3.47	1	17
Type D total score	14.43	6.95	3	30

SD: standard deviation; ESES: Dietary Self-Efficacy Scale; ESLI: Emotional/Social Loneliness Inventory; SF36: Health Survey Short Form 36; Type D: Type D Personality Scale Hungarian version.

levels of dietary self-efficacy beliefs. The mean scores on the TDP assessment for both negative affectivity and social inhibition scales were below the agreed cutoff value (≥ 10) for a person to be classified as TDP. Patients also reported average mental health and better than average physical health.

We also tested whether there was any difference across education levels (below undergraduate, undergraduate and graduate) in terms of dietary self-efficacy and TDP using the Kruskal–Wallis test. There were no differences across these groups ($\chi^2_{ESES} = 3.39$ and $\chi^2_{TYPE\ D} = 2.77$). The Mann–Whitney test was used to evaluate differences in relation to cohabitation (living/not living with anyone). There were no differences in TDP and dietary self-efficacy ($Z_{ESES} = -0.16$ and $Z_{TYPE\ D} = -1.22$). Furthermore, we found no sex differences in this sample ($Z_{ESES} = -0.92$ and $Z_{TYPE\ D} = -0.16$). However, there was a significant difference in social and emotional loneliness for cohabitation and living alone ($Z_{SOCIAL} = -4.51$; $P < 0.001$; $Z_{EMOTIONAL} = -2.98$; $P = 0.003$). Interestingly, participants living with a partner experienced more loneliness.

Table 3 shows correlation coefficients for the main psychometric measures. Dietary self-efficacy (ESES) and social isolation (ESLI) showed a close to perfect correlation; patients who felt more isolated reported more complications about regulating dietary behaviors ($P < 0.001$). ESES scores were also positively related to self-reported mental health (SF36); patients with more mental issues reported more dietary problems ($P < 0.01$). On the TDP measure, negative affectivity had the strongest impact on self-efficacy (ESES), as patients who experienced more negative emotions described more difficulties with dietary issues ($P = 0.001$). Additionally, participants with higher scores on both TDP scales reported more mental health problems ($P < 0.001$). Self-reported physical health was inversely related to TDP; participants with higher scores on both negative affectivity and social inhibition experienced poorer physical health ($P < 0.001$).

We also found significant relationships among the following pairs of variables: ESES × weight ($r = 0.27$; $P < 0.001$): higher weight level was related to more problems with dietary self-efficacy; ESES × time since diagnosis ($r = -0.18$; $P = 0.011$): patients who had received treatment for longer reported fewer problems with dietary self-efficacy; ESES × physical exercise (self-reported) ($r = -0.14$; $P = 0.039$): patients who reported more physical exercise had fewer problems with dietary regulation; ESES × dietary compliance (self-reported) ($r = -0.25$; $P < 0.001$): subjects who were able to follow their diet had fewer dietary difficulties; physical exercise × TDP ($r = -0.14$; $P = 0.033$): patients who reported more physical exercise were less likely to show symptoms of TDP; Dietary compliance × physical exercise ($r = 0.45$; $P < 0.001$): patients who exercised more were better able to follow their diets. Finally, physical exercise was negatively related to mental health ($r = -.30$; $P < 0.001$); that is, more physical exercise was associated with fewer mental health problems.

HbA1c was negatively correlated with self-reported physical health ($r = -0.19$; $P = 0.009$), self-reported exercise ($r = -0.14$; $P = 0.03$) and self-reported dietary compliance ($r = -0.13$; $P = 0.048$). Patients with T2DM who reported better physical health, exercised more and who kept to dietary restrictions more stringently had lower HbA1c.

Finally, a subsample of patients with HbA1c ≥ 7.0 was selected for multiple regression analysis to predict dietary self-efficacy behaviors. The full regression model was significant ($F = 178.50$; $P < 0.001$) and the independent variables explained 93.4% of the variance in the dependent variable ($R^2 = 0.939$). That is, only 6.6% of the

Table 3. Correlations among main psychometric measures (N = 178). [AQ1]

		ESES (negative affect)	ESES (social affect)	ESES (full scale)	ESLI (social loneliness)	ESLI (emotional loneliness)	ESLI (social isolation)	ESLI (emotional isolation)	SF36 (physical health)	SF36 (mental health)	Type D (negative affect)	Type D (social inhibition)	Type D (full scale)
ESES (negative affect)	Correlation coefficient	1.000	0.651**	0.884**	0.085	0.165*	0.836**	0.204**	−0.011	0.226**	0.226**	0.157*	0.201**
	Sig. (1-tailed)		<0.001	<0.001	0.130	0.014	<0.001	0.003	0.444	0.001	0.001	0.018	0.004
ESES (social affect)	Correlation coefficient		1.000	0.892**	0.040	0.074	0.806**	0.180**	0.025	0.155*	0.124	0.059	0.097
	Sig. (1-tailed)			<0.001	0.297	0.163	<0.001	0.008	0.368	0.019	0.050	0.216	0.100
ESES (full scale)	Correlation coefficient			1.000	0.088	0.136*	0.932**	0.221**	0.009	0.200**	0.202**	0.125*	0.172*
	Sig. (1-tailed)				0.122	0.035	<0.001	0.002	0.455	0.004	0.003	0.048	0.011
ESLI (social loneliness)	Correlation coefficient				1.000	0.709**	0.069	0.505**	−0.207**	0.297**	0.172*	0.269**	0.227**
	Sig. (1-tailed)					<0.001	0.181	<0.001	0.003	<0.001	0.011	<0.001	0.001
ESLI (emotional loneliness)	Correlation coefficient					1.000	0.133*	0.542**	−0.177**	0.290**	0.273**	0.340**	0.331**
	Sig. (1-tailed)						0.038	<0.001	0.009	<0.001	<0.001	<0.001	<0.001
ESLI (social isolation)	Correlation coefficient						1.000	0.184**	0.009	0.210**	0.196**	0.095	0.154*
	Sig. (1-tailed)							0.007	0.451	0.002	0.004	0.103	0.020
ESLI (emotional isolation)	Correlation coefficient							1.000	−0.253**	0.216**	0.245**	0.235**	0.262**
	Sig. (1-tailed)								<0.001	0.002	<0.001	0.001	<0.001
SF36 (physical health)	Correlation coefficient								1.000	−0.476**	−0.251**	−0.226**	−0.258**
	Sig. (1-tailed)									<0.001	<0.001	<0.001	<0.001
SF36 (mental health)	Correlation coefficient									1.000	0.492**	0.441**	0.515**
	Sig. (1-tailed)										<0.001	<0.001	<0.001
Type D (negative affect)	Correlation coefficient										1.000	0.623**	0.913**
	Sig. (1-tailed)											<0.001	<0.001
Type D (social inhibition)	Correlation coefficient											1.000	0.877**
	Sig. (1-tailed)												<0.001
Type D (full scale)	Correlation coefficient												1.000
	Sig. (1-tailed)												

*Correlation significant at the 0.05 level (1-tailed).
**Correlation significant at the 0.01 level (1-tailed).
ESES: Dietary Self-Efficacy Scale; ESLI: Emotional/Social Loneliness Inventory; SF36: Health Survey Short Form 36; Type D: Type D Personality Scale Hungarian version.

variance in dietary self-efficacy was unexplained. We therefore considered the regression model an extremely good fit of the data. Multicollinearity (tolerance values under 0.4) was also tested. The range of tolerance values was between 0.48 and 0.91 for our set of independent variables, indicating no influence on the model estimation.

Table 4 shows the regression coefficients of the linear model. Four variables were significant: social isolation, emotional isolation, mental health and time since diagnosis. The beta weights, which indicate the relative importance of each variable to the dependent variable, showed that social isolation ranked first, followed by emotional isolation, mental health and time since diagnosis. The beta coefficients indicate the effect of a unit change in the dependent variable caused by the unit change in the independent variable. That is, a 1-point increase on the social isolation measure (greater isolation) would increase dietary self-efficacy by 3.3 points (greater difficulty managing the diet). Similarly, a 1-point increase on the emotional isolation measure (greater isolation) would result in a 0.38-point increase in dietary self-efficacy (greater difficulty managing the diet). A 1-point increase in mental health score (worse mental health) would increase dietary self-efficacy by 0.32 points (greater difficulty managing the diet). Finally, a 1-year increase in time since diagnosis of diabetes decreased dietary self-efficacy by 0.27 points; that is, self-efficacy and dietary behaviors improve with each year that passes.

Discussion

The primary purpose of this research was to predict the dietary self-efficacy of high HbA1c patients using a set of psychometric measures, including TDP. Our final regression model explained 94% of the variance in dietary self-efficacy; social isolation was responsible for the most significant effect. Social and emotional isolation, mental health status and time since disease diagnosis all successfully predicted self-confidence in dietary behavior control. In terms of relative importance, social isolation had the strongest negative effect on

Table 4. Regression coefficients for the final linear model (dependent variable: dietary self-efficacy).

Model (N = 96)	Unstandardized coefficients		Standardized coefficients		
	B	Std. error	Beta	t	Sig.
(Constant)	12.652	8.582		1.474	0.143
ESLI (social loneliness)	−.103	.181	−.017	−.567	0.572
ESLI (emotional loneliness)	−.062	.205	−.010	−.302	0.763
ESLI (social isolation)	3.325	.082	.964	40.687	<0.001
ESLI (emotional isolation)	.378	.191	.053	1.977	0.050
SF36 (physical health)	.035	.109	.009	.321	0.748
SF36 (mental health)	.317	.135	.087	2.346	0.022
Time since diagnosis	−.270	.103	−.060	−2.615	0.010
Dietary compliance (self-report)	.083	.398	.005	.208	0.835
Exercise (self-report)	−.251	.315	−.021	−.796	0.427
Negative affect (type D)	.076	.233	.010	.325	0.746
Social inhibition (type D)	.462	.284	.050	1.627	0.106

ESLI: Emotional/Social Loneliness Inventory; SF36: Health Survey Short Form 36; Type D: Type D Personality Scale Hungarian version.

self-efficacy: a 1-point increase on the isolation scale increased the self-efficacy score by 3 points (recall that higher scores on the self-efficacy measure indicate less confidence in dietary control). That is, patients who felt more socially isolated perceived dietary confidence as more of a challenge. To improve clinical support to patients, psychologists should be consulted to identify patients with social isolation symptoms, who could then be helped to overcome such feelings to increase self-confidence in their dietary skills. Although TDP did not reach significance as a predictor of dietary self-efficacy, social isolation may be considered a precursor of TDP, and therefore merits greater clinical attention. As social isolation is a perception, cohabitation does not necessarily guarantee that a person is not isolated. We found no difference in social isolation between patients who cohabited and those who lived alone.

Considering TDP, we found that the prevalence of TDP was slightly higher than previously reported.[9,10] Although TDP was significantly correlated with self-efficacy and the main measures (unlike social isolation), it did not explain dietary self-efficacy behaviors. However, patients who exercised more had lower TDP scores. Those who exercised regularly also reported fewer dietary regulation problems. The findings confirm the importance of exercise as a tool to manage both weight and self-confidence to help control dietary behaviors.

Time since diagnosis was inversely related to dietary self-efficacy; patients who had received treatment for longer reported fewer difficulties keeping to their diet. This may be because patients find coping with dietary restrictions less difficult over time and gradually experience more positive achievements.

Our data suggested a limited relationship between HbA1c values and psychosocial measures, except for self-reported physical functioning and self-assessed dietary compliance. Our findings resonate with those of Nefs et al.,[19] who also reported little or no link between laboratory and psychological measures. In contrast to the findings of Strychar et al.,[1] we identified no association between dietary self-efficacy per se and HbA1c. However, we confirmed that patients with T2DM had lower HbA1c values when their self-assessed dietary compliance was higher. This may be explained by the non-normal distribution of our HbA1c data; despite an attempt to use mathematical transformations, the HbA1c data were not improved sufficiently for correlations with psychometric measures.

There are some potential limitations to this study. We acknowledge that part of the study sample was drawn from a patient population that consisted of more severe cases of diabetes attending a university medical center. We also recognize that data for some variables showed non-normal distributions. Therefore, assumptions about the generalizability of results should be made with caution.

In conclusion, dietary self-efficacy (a precursor of long-term survival on diabetes therapy) showed a strong linear relationship with social isolation. Our regression outcomes suggested that a drop in patient perception of social isolation by, for example, 10% would improve dietary efficacy beliefs by 30%, a highly significant clinical achievement to enhance dietary adherence and patient survival. However, this hypothesis must be confirmed by real-life clinical research. We therefore recommend future evaluation of clinical interventions to improve social isolation perception and to assess their impact on dietary efficacy, laboratory outcomes, HbA1c and changes in BMI.

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The authors declare that there is no conflict of interest.

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ORCID iD

Miklós Zrínyi ⓘ https://orcid.org/0000-0001-7741-7814

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