

Behind the Curtain: Patients' Perceptions, Treatment Expectations and Behavior in Type 2 Diabetes Mellitus Self-management

Andrea Klinovszky, PhD

Norbert Buzás, PhD

Viola Sallay, PhD

Csaba Lengyel, PhD

Orsolya Papp-Zipernovszky, PhD

Objectives: The objectives of this qualitative study were to understand patients' diabetes perceptions and treatment experiences, and to explore the most common behavioral aspects related to Type 2 Diabetes Mellitus (T2DM) self-management. **Methods:** We included 50 insulin-treated T2DM patients in the study. The semi-structured interview texts were analyzed using thematic analysis. The interview questions were organized around 3 major groups of questions focusing on the history of the disease, the current treatment regimen, and the ecological context of the treatment. **Results:** According to the results of our qualitative analysis, the emotional correlates dominated a significant proportion of responses of insulin-treated T2DM patients. Moreover, we stated that exploring and understanding diabetes-specific coping strategies, attitudes to insulin therapy, patients' treatment satisfaction and openness to new insulin delivery technologies are essential for providing professional support in diabetes treatment. **Conclusion:** The therapeutic behavior of insulin-treated T2DM patients is determined by the patients' emotional engagement with diabetes and treatment, and the effectiveness of the given diabetes-specific methods for coping with treatment-related difficulties.

Keywords: T2DM, Self-management, Coping Strategies, Attitudes to Insulin Therapy, Openness to new Diabetes Technologies, Diabetes Behavior.

Am J Health Behav.™ 2023;47(6):1080-1097

DOI: <https://doi.org/10.5993/AJHB.47.6.1>

According to the World Health Organization (WHO), Type 2 Diabetes Mellitus (T2DM) has become a challenging health problem in the 21st century. It is a complex metabolic disease, characterized by relative insulin deficiency caused by pancreatic β -cell dysfunction and insulin resistance in target organs.¹ T2DM as a chronic disease is associated with serious complications including both microvascular and macrovascular comorbidities and it requires adherence to complex lifestyle therapy in addition to medication.² According to the American Association of Diabetes Educators (AADE), diabetes self-care activities include medical nutrition therapy, medication adherence, regular physical activity, glycemic monitoring, proactive coping skills, effective problem-solving, and risk reduction behaviors.^{3,4}

The Role of Illness Perception and Coping in T2DM Self-management

Self-care and self-management activities are complex, life-long and they are embedded in patients' unique life situations.^{5,6} 'Self-management is defined as the ability of patients to adopt and maintain certain health-promoting behaviors'.⁷ It comprises 3 different sets of activities – medical management (e.g., taking medication and adhering to nutrition therapy), behavioral management (e.g., adopting new behaviors in the context of chronic disease); and emotional management (e.g., being able to cope with the negative feelings associated with chronic disease).⁸ Self-management is effective when T2DM patients are able to control all these aspects of their lives on their own.⁸ Rivera et al.⁹ state that one of the

Andrea Klinovszky Researcher & Norbert Buzás, Habil Associate Professor, Department of Personality and Health Psychology, ELTE Eotvos Lorand University, Budapest, Hungary. Viola Sallay, Senior Lecturer, Department of Psychology, University of Szeged, Szeged, Hungary. Csaba Lengyel, Professor, 1st Department of Internal Medicine, University of Szeged, Szeged, Hungary. Orsolya Papp-Zipernovszky, Habil Associate Professor, Department of Personality and Health Psychology, ELTE Eotvos Lorand University, Budapest, Hungary.

Corresponding Author: Dr. Norbert Buzás, Email: buzas.norbert@med.u-szeged.hu

reasons why self-care varies among T2DM patients is that these individuals conceptualize their disease, its treatment, and its significance differently.

This conceptualization is well described by Leventhal's illness perception model,¹⁰ where identity (symptoms), consequences, timeline, cause, controllability, emotional representations and illness coherence are the basic components of illness representations. These perceptions are closely linked to diabetes self-management activities and can influence the way people act and cope with the disease;^{10,11} they play an even more significant role in the healing process than disease severity.¹² People diagnosed with T2DM may experience a wide range of negative emotions and feelings during diabetes management (emotional representation)¹⁰ due to the overwhelming nature of self-management regimens and constant fear of diabetes-related complications.^{7,13-15} Additionally, T2DM patients who are using insulin report significantly more anxiety and more emotional distress during diabetes self-care¹⁶⁻¹⁹ and they also have less confidence than patients who are not under insulin therapy.¹⁹⁻²¹ Long-term anxiety over hypoglycemia symptoms and related everyday self-care activities can cause chronic stress which can worsen glycemic control of patients, creating a vicious circle in their lives.^{18,22}

Another important component of Leventhal broadened self-regulatory model is coping style. Folkman and Lazarus²³ define 'coping as the cognitive and behavioral tasks used to manage stressful situations'. Coping processes are dynamic; they fluctuate over time and across different situations,²³ so they cannot be understood as stable personality traits.²⁴ According to classic coping theory, there are 2 types of coping strategies – task-oriented and emotion-oriented. Emotion-oriented coping involves efforts to regulate negative emotions that emerge when confronted with a stressor, whereas task-oriented coping means a belief in the ability to address the stressor and take active steps to handle the problematic situations.²⁵ Avoidance-oriented coping has emerged as a third class of coping strategies and involves cognitive and behavioral efforts oriented toward denying, minimizing or avoiding the problem or the stressor.²⁶

It is important to note that whereas diabetes-related coping strategies and coping behavior of insulin-treated T2DM patients are relevant, these areas are less explored in diabetes research.^{18,24,27} The use of adequate coping strategies during diabetes management is an objective of psychological interventions.²⁸ Previous research that measured illness perceptions, coping strategies, and quality of life in people living with multiple chronic

conditions found that DM patients' coping strategies play an important part during adaptation to chronic disease and can impact their attitude towards future treatment programs.²⁹ Martino et al.^{30,31} found that defense mechanisms may serve as emotion-focused coping behavior among DM patients; they mainly work as protective factors against experiencing diabetes-related distress and help to reduce the emotional suffering related to chronic illness. On the other hand, some have stated that adaptive coping strategies can help improve HbA1C levels and dietary behavior in the long-term.²⁸ In line with the aforementioned results, one focus of our qualitative study is patients' diabetes perceptions and treatment experiences highlighting their everyday feelings and coping with their difficulties coming from living with the disease.

Attitude toward Treatment and New Technologies

The success of diabetes self-management also relies on patients' attitudes to insulin therapy. Although insulin therapy has been demonstrated to be effective in T2DM management, it is often refused or postponed by T2DM patients.³² In a study built on thematic synthesis, researchers found that diabetes patients believe insulin therapy is the final resort for treatment and is primarily linked to personal failure in managing their condition. Furthermore, studies have found that refusal to receive insulin therapy often can be traced back to patients' lack of knowledge about the disease, negative attitudes to insulin therapy, fear of injections, and further psychological and social factors.^{19,32,33} Due to the invasive treatment tools new technologies are becoming increasingly important in diabetes treatment. These diabetes-specific technologies include the continuous glucose monitoring systems, the automated insulin administration systems, devices, mobile applications, online resources, and telemedicine.³⁴

Kulzer et al.³⁵ highlighted that diabetes technologies could support therapy in DM while understanding patients' attitudes, needs and opinions related to these technologies could help to develop and adapt them to patients. Moreover, new technologies could facilitate diabetes self-management and insulin therapy among diabetes patients.³⁴ Diabetes technology also could help to reduce diabetes distress and improve treatment satisfaction among patients,³⁴ although in most cases, positive changes in glycemic control and other health-related diabetes outcomes are relatively marginal.³⁵ Another study found that patients with T2DM interact

with modern diabetes technologies less frequently, and therefore, do not experience their benefits.³⁵

Patients' Behavioral Aspects during Diabetes Self-management

Enhancing self-management is a complex and critical step that requires a paradigm shift in diabetes care^{9,36} which includes understanding the personal aspects of T2DM patients' self-management behaviors (e.g., personal characteristics and skills).³⁷ One of the reasons is that it can be traced back to the multifaceted nature of diabetes self-management. Psychological variables and patients' personal characteristics and skills can influence daily diabetes self-management behavior.³⁷ Current qualitative research focuses on understanding the aforementioned complex individual and environmental factors and processes by also setting up profiles of patients based on our qualitative results. We do not know any study in this topic that extends qualitative research by quantitative cluster analysis. Studies using quantitative research methods, such as those by Alexandre et al.³⁸, Vég et al.³⁹, and the DIABASIS research,⁴⁰ were among the first to show that during patients' diabetes self-management, the occurrence of certain types of people with similar characteristics and behavioral attitudes cannot be ignored. For example, Alexandre et al.³⁸ identified 4 distinctive diabetes self-management profiles – the high self-appraisal, limited engagement, strained, and distressed profiles of patients. Researchers highlighted that patients who belong to the strained profile group are representing a small but significant subpopulation among diabetes patients and to whom more attention should be paid during diabetes therapy. Vég et al.³⁹ identified 3 categories of self-management profiles and named these groups of patients disease manager, compliant, and disheartened. In the DIABASIS study that measured T2DM patients' self-management, researchers identified 5 distinct patient types – committed (25%), carefree (23%), bitter (19%), disheartened (19%), and overwhelmed (15%). According to this study, the most evident differences between categories were patients' commitment to lifestyle changes, especially exercise, and their support needs for diabetes management. During the exploratory multivariate analytical method of canonical typology, it was concluded that the most problematic patients were the 'bitter' and 'overwhelmed' patient groups. Moreover, the study found that 'disheartened' and 'overwhelmed' patients are more overweight, and 'bitter' and 'overwhelmed' patients are more frequently treated with insulin. In addition, 'overwhelmed' patients

appear to have more frequent feelings of depression and are overall less satisfied with their treatment.⁴⁰

It is important to note that national surveys based on representative samples or studies using standardized scales and questionnaires cannot explore T2DM patients' experiences in depth. Moreover, there are few qualitative studies that measure complex T2DM management practices including patients' behavioral and emotional experiences during treatment and living with complex chronic disease.^{41,42} We believe that this complex phenomenon is only approachable by combined research methods.

Aim of the Study

The primary goal of the study was to explore and understand patients' treatment perceptions and their behavior during T2DM self-management. The secondary goal by further quantitative calculations was to provide a comprehensive overview of T2DM patient types that are most frequently encountered in patient care.

METHODS

Participants

We selected interview participants using stratified convenience sampling and snowball sampling. The final sample consisted of 50 insulin-treated patients (24 male and 26 female), who were diagnosed with T2DM. Exclusion criteria included documented intellectual disability, decreased cognitive function, or severe psychiatric disorder. During the recruitment of patients, 20 people rejected participation in the study. Five persons dropped out of the sample because they were so touched by their previous memories and facts about DM that they asked the interviewer if they could quit the interview.

The mean age of the patients was 64.82 years (SD = 9.735) and they all had been diagnosed with T2DM for an average of 18.77 years (SD = 12.303). In terms of education, 22 of them finished high school that was the modal category for education level. The majority (N=30) of the participants were married. They were asked to rate their financial situation on a scale of 1 to 10 on the basis of subjective judgment. According to the results, individuals gave an average value of 5.98 to their subjective financial situation. Table 1 shows these results. In the final sample, there were 41 (82%) patients that experienced one or more comorbidities; 9 (18%) patients reported having no other illnesses besides T2DM or were unaware of any. The most common diabetes complications were hypertension (42%) and cardiovascular disease (38%). Table 2 shows these results.

Table 1
Sociodemographic Characteristics of the Sample

Sociodemographic Factors		N=50
Sex	Male, N (%)	24 (48%)
	Female, N (%)	26 (52%)
Age (years), mean (SD), range		64.82 (SD = 9.735), 37–96
Education level	Primary school	11 (22%)
	Vocational school	2 (4%)
	High school	22 (44%)
	Gymnasium	1 (2%)
Marital status	University	14 (28%)
	Single	3 (6%)
	Married	30 (60%)
	Divorced	2 (4%)
	Relationship	2 (4%)
Satisfaction with material status (rated on a 10-point scale, ranging from 1 – extremely unsatisfied to 10 – extremely satisfied)	Widowed	13 (26%)
		5.98
Note.		
Percentage based on the number of subjects per item.		
Abbreviations: SD = standard deviation		

Table 2
Diabetes and Health-related Factors among Insulin-treated T2DM Patients

Diabetes and Health-related Factors		N (%)
Duration of diabetes (years) mean (SD)		18.77 (SD = 12.303)
Diabetes complications	Vision impairment	6 (12%)
	Cardiovascular disease	19 (38%)
	Hypertension	21 (42%)
	Nerve damage	5 (10%)
	Kidney failure	4 (8%)
	Lower limb amputation	3 (6%)
Note.		
SD = standard deviation, N=sample size, % = percentage		

Study Measurements

Pre-testing of semi-structured interview questions and trustworthiness of the qualitative research:

Triangulation was used in our research as a process of developing understanding through the utilization of multiple data sources. Memos and field notes were written during and after the interviews. The interviewer recorded self-reflections, non-verbal, metacommunicative signs of the subjects (e.g., facial expressions, gestures, proxemics etc), and any important information related to the research that the patient provided after the recorder was turned off (e.g., expressing gratitude for being listened to). The overlaps among the questions contributed to the measurement of reliability. There was also an audit trail so the texts of the transcripts were analyzed by the research team and an independent encoder who was not a member of the research team. After a manual analysis

of the qualitative data, the final transcripts were uploaded into Analysis Software for Content in Qualitative Research – ATLAS.ti 8, a qualitative software program for coding and theme generation. Before coding, the units of the texts in the sample were categorized, and to draw replicable and valid conclusions, they were recoded by 2 independent coders. The differences between coders were examined using Krippendorff's internal reliability value.

To ensure trustworthiness during semi-structured interviews the research team tried to establish a confidential atmosphere and rapport. In addition, the interviews were recorded privately in a closed and quiet room. The semi-structured interview questions were tested with a pilot study consisting of 10 participants. This was necessary to make sure that the participants understood the questions and that the construction of the semi-structured interviews was consistent with the participants' thinking. In addition, we tried to approach the research topic in the most complex way possible; so, when some comments or questions that we had not thought of before recurred, we incorporated them into the final set of questions as lessons learned from the pilot research. The research team formulated open-ended questions and avoided to use ambiguous or suggestive questions during interviewing.

The interview guide: A qualitative study using semi-structured interview techniques was carried out. The interview questions were organized along 3 main groups of questions focusing on the history of the illness, the current treatment regimen, and the ecological context of the treatment which is related to the environmental (social and situational) parameters that could affect treatment effectiveness. The final interview guide is appended to the manuscript. The elements related to the content were drafted following the recommendations of the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist. The checklist is included in Supplement 1. Qualitative results from semi-structured interviews related to insulin-treated T2DM patients' treatment experiences, diabetes-therapy expectations, adherence and quality of life were analyzed and evaluated by using thematic analysis.

Data Collection and Participant Recruitment

Data were collected during semi-structured interviews between October 2018 and September 2019. The interviewer conducted the research as part of her doctoral studies. Therefore, her interest was to carry out the most accurate research with methodologically

correct steps. During data collection, patients who appeared in routine patient care at the 1st Department of Internal Medicine, Szent-Györgyi Albert Clinical Centre, University of Szeged were personally informed about the research by the interviewer. The participation rate in semi-structured interviews was 85.7%. During snowball sampling followed by a telephone inquiry, the interviewer and the interviewee agreed on the date and details of the face-to-face interview study. All persons participated in the interview on a voluntary basis. The patients also were informed about their right to discontinue the interview and that there would be no consequences whatsoever regarding their non-participation. The interviews were audio-recorded with the patients' consent and transcribed with the deletion of personal data to ensure the confidentiality of the participants' data in accordance with ethical rules. The interviews were recorded privately in a closed and quiet room. The interviews lasted 90 minutes on average.

Data Analysis

All the interviews were transcribed by verbatim transcriptions. After manual analysis of the qualitative data, the final transcripts were uploaded into Analysis Software for Content in Qualitative Research – ATLAS.ti 8, a qualitative software program for coding and theme generation. Qualitative data were analyzed with thematic analysis as a theoretical framework. Thematic analysis is a method that helps to identify, analyze, and report patterns (themes) within data. Moreover, using the method of thematic analysis can interpret various aspects of the research topic through inductive and deductive analysis process. We have chosen the method because it is a realist method that reports the experiences, interpretations, and reality of patients. The texts of the transcripts were analyzed by 2 of the authors and by an independent encoder, who was not a member of the research team. Before coding, the units of the texts in the sample were categorized, and to draw replicable and valid conclusions, they were recoded by 2 independent coders and differences between coders also were examined. The internal reliability of the resulting qualitative results was calculated using Krippendorff's internal reliability value, according to which the alpha value =.920, ie, strong inter-rater reliability was detected. When reviewing the texts of the semi-structured interviews, we approached the analysis in an open way. More precisely, this means that we had pre-formulated categories in our minds, but we coded in an open manner; so, if a new category

appeared during the analysis of the interview texts, we named it using 'middle-level' codes, grabbing psychological phenomena. In addition, Krippendorff's inter-rater reliability method was used before continuing the analysis of the interview texts with ATLAS.ti 8. When carrying out a thematic analysis, inter-rater comparisons provide a valuable opportunity to open up the rationale for the coding frame to the scrutiny of others, to examine and discuss the reasons for any differences in coding decisions, and thus, to fine-tune the theoretical bases and definitions for the coding categories. Qualitative research in the fields of medicine and health psychology mainly uses thematic analysis because it is a form of analysis that is meaningful and acceptable to both researchers who normally employ quantitative methods and those who prefer a qualitative approach.^{43,44} Quotations illustrating the main themes and findings are provided in the Results section. To ensure that the examples are illustrative of the findings, we have provided the most salient quotations from the interview transcripts identified by sex and age of anonymized participants.

Reflexivity Statement

Reflexive practices were used to align our decisions at all stages of the qualitative research. We wrote memos and field notes after interviews to identify and document critical interpersonal dynamics impacting participants and their data. It is important to note that the analysis also took into account the interviewer's self-reflections and the nonverbal, meta-communicative signs of the subjects (e.g., facial expressions, gestures, proxemics, etc), as well as any important information related to the research that the patient provided after the recorder was turned off (e.g., expressing gratitude for being listened to). We also held team meetings several times during the period of data collection to share the experiences of the interviews.

RESULTS

We examined the content of semi-structured interviews with insulin-treated T2DM patients. The responses were typed and analyzed with thematic analysis. During the analysis, the following main themes were identified – *representation of illness*, *emotional response to disease*, *living with the disease*, and *openness to new technologies*. Within the main themes, differences in responses were further structured into sub-themes and categories. The sub-themes and categories were illustrated using a coding tree and are

displayed in Table 3. It is important to highlight the representations of illness, and these will be presented in another paper. Moreover, given the length constraints of a journal article, we present only those variables of the coding units that have shown significant response differences based on a further cluster analysis detailed later in this paper. Our goal with this complementary

quantitative method was to be able to discover and create typologies that diabetologists/physicians can use in practice to more easily recognize problematic insulin-treated T2DM patients. These themes and sub-themes included *emotional response to disease*, *long-term coping*, *attitude to insulin use*, and *openness to new technologies*.

Table 3
Code Tree of Thematic Analysis and Highlighted Themes and Sub-themes

Themes	Sub-themes	Categories	Sub-categories	
Illness Perceptions	Self-Illness relationship	Illness as an authority		
		Self-confirmation		
		Symbiosis		
		Illness as a loss		
		Illness as an enemy		
		Extension of identity		
		Illness as a discharge		
		Illness as a challenge		
<i>Emotional response to disease</i>	Negative			
	Trivialization [nothing]			
	Living with the disease	Unchanged everyday		
		Disrupted balance		
	Lack of control		Perfectionism Situational factors Lack of information	
<i>Living with the disease</i>	Acquired control	Control	By paying attention	
			Social pressure	
			By paying attention	
			By healthcare	
			Social support	
			Through effort/learning	
		Alternative therapies		
		Self-efficacy		
		Successful long-term coping	Family Personalization Emotion-focused coping Spiritual processing	
			Alternative occupation (avoidance)	
			Develop own strategy	
			Task performing	
			Defense mechanisms	
			Lack of self-strength	
			Lack of social support	
			Failed therapy	
			Cumulative trauma	
			Prioritization of others	
			Due to financial problems	
			Defense mechanisms	
		Fears about taking insulin		
		Insulin as rescuer		
		Feeling of being ill		
		Insulin as a pharmaceutical form		
		Short-term enthusiasm		
		Openness		
		Rejection		
	<i>Openness to new technologies</i>			

Theme 1: Emotional Response to Disease

One of the main themes identified during the qualitative analysis was *emotional response to disease*. The topic comprises emotional responses related to experiences of learning about having T2DM, living with T2DM, and being introduced to related medical

treatments. A significant proportion of responses is dominated by emotional correlates.

Sub-theme 1: emotional response to disease: Within the theme of *emotional response to disease*, 2 fundamental emotional reactions emerged as sub-themes – *trivialization* and *negative emotion*.

Delivered by Ingenta to IP: 160.114.150.232 on: Mon, 05 Feb 2024 10:54:15
Copyright (c) PNG Publications. All rights reserved.

T2DM patients whose emotional response is often trivialized underestimate the symptoms of their diabetes, frequently lack an awareness of their disease, define chronic metabolic disorder primarily as a condition, deny the existence of the disease, and often emphasize the insignificance of diabetes. This type of emotional response was observed in 78% (N=39) of the respondents.

Well... I don't know (laugh). Well, it isn't a serious disease! Well, one must not bury oneself. Especially not because of diabetes. You have it, and that's it... Because as I've said before, I do not take my diabetes seriously. I firmly believe, it shouldn't be taken seriously. (woman, 60 years old)

Negative emotional responses characterized 96% (N=48) of the diabetes patients. Within this sub-theme, we coded statements and thoughts that expressed worry, doubt, dislike, or disappointment about the diagnosis of diabetes, its current treatment, failures or difficulties in living with chronic disease, specifically those that hinder keeping to a prescribed treatment or accepting the disease.

...diabetes makes my life miserable. (woman, 57 years old)

Sub-theme 2: long-term coping: Within the sub-theme of *long-term coping*, 2 aspects were considered – when long-term coping is successful (proactive) and when the attempt to adapt is hindered or fails. *Personalization* as a long-term coping strategy proved to be successful with 76% (N=38) of diabetes patients. It means that a significant number of patients with diabetes have the appropriate parameters in their 3-month glycemic control when it comes to evaluating the effectiveness of their efforts. Illustrated by the quotes below, the basis of long-term coping in these patients is their *personal self-effectiveness*. Patients explore and control a variety of external impacts on their blood glucose level, well-being or they actually correct and modify medical prescriptions, treatment principles to make them more acceptable and more adaptable in their usual routines.

You can't keep to them! Not this rigorously. I've heard of a person who was so strict with themselves that the food they ate was measured out, and even then, they had to have their eyes operated [on]. I'm still at this stage, and I can only function in this cowboy system. (man, 60 years old)

...I do this in a quite unique way but the results are good... (man, 39 years old)

During the thematic analysis, stressful situations caused by diabetes and its treatment were linked

to a number of negative or ambivalent emotional reactions, which some diabetes patients overcame by managing their negative affective state rather than changing their circumstances. This can imply a kind of psychological regression; many patients (N=29; 58%) deploy primitive defense mechanisms (e.g., repression, denial, etc), that if persisting for a long time, may reduce individuals' adherence to diabetes treatment.

...I have this what's-it-called, that I feel the crumbs on the floor under my feet. And so... I think, that's my opinion, that until I can feel those crumbs on the floor, I have no fear of my diabetes. (man, 74 years old)

I've had diabetes since 2008, that's 11 years. There are some who had their limbs cut off in only 5-6 years! Limbs were cut off! I cut my leg under the knee, we compressed it with a belt and went to the hospital, there they put 3 clips on it and it healed. If you're really a diabetic, then there's no chance it will heal! (man, 55 years old)

Sub-theme 3: attitude to insulin use: Within the main sub-themes, a significant difference in responses was stated in the *attitude to insulin use*. Within this, the research team examined patients' experiences, expectations, emotions and views related to insulin therapy. The interviews revealed that patients' attitudes to insulin are mostly influenced by their previously formed beliefs about insulin therapy (e.g., insulin fattens, it can cause infertility, needle stick pain, etc). The most common emotions related to insulin were fear, despair, anger, and frustration. Besides the above, there were many responses that related the introduction of insulin therapy to the severity of the disease. The 2 most common attitudes toward insulin and the mode of insulin administration were *fears about taking insulin* and *insulin as a rescuer*.

Among the T2DM patients in the study, 84% (N=42) primarily reported having negative feelings about insulin therapy, with fear being the predominant one. Whereas many patients reported being afraid of insulin therapy and using a pen, a part of them had this reaction of fear only at the beginning of the treatment. As control loss is mostly felt physically, attitudes toward taking insulin were described in terms of physical experiences.

I tell you, it's like a constant fight. It's like I am a dragon... like being a dragon tied up on a chain by the devil. Being on insulin and being diagnosed with diabetes is something like that. (woman, 44 years old)

The category named *insulin as a rescuer* characterized 70% of respondents (N=35) and was identified based on 3 types of responses. First, thanks to insulin, many

reported better general health, believing that it helped them control the severity of their disease. Second, insulin helped them ease the rigorous restrictions of medical diet therapy as part of lifestyle therapy, and it also ensured a more relaxed attitude toward the amount of food they were allowed to consume.

Should I not eat ham? No sausage? Well, a diabetic is allowed to eat everything, everything is allowed but with measure. Even ice cream and cake! That's where you get insulin! Swoosh (imitates the sound of a rocket toy landing) and I swallow it! You just need to know how much. (man, 60 years old)

Well, it has good effects [insulin therapy]. Considering the condition of my eyes... well I could have become blind, an old lady with a white walking stick. (woman, 59 years old)

Theme: Openness to New Technologies

Easy insulin administration and a flexible attitude to therapy are crucial factors because patients may need new therapy modifications due to progressive disease and decreased insulin secretion. It is indispensable for patients to be able to use the technological tools required for insulin administration and to be satisfied with the individualized therapy of diabetes. Therefore, the fourth main theme was *openness to new technologies*, which summarized patients' expectations and experiences related to new technologies (e.g., mucoadhesive film, oral insulin capsules). Based on our results, about 42% (N=21) of the interviewed persons were satisfied with their current insulin administration technology, while 46% (N=23) of them complained about needle use. At the same time, openness to new technologies can be detected in 20% of patients (N=10), who would expect new developments to be easier to use (e.g., the majority of patients find taking insulin more time-consuming than previously taking antidiabetics, many complain about the frequency of the treatment, the loss of spontaneity). Another expectation of theirs is to be able to inject insulin discreetly in social environments and that there are fewer side effects. In addition, there were complaints that the current technological devices for blood glucose measurement and the needles and pens used for insulin administration are not environmentally friendly; thus, these aspects also should be taken into account when developing new insulin delivery devices. Sample quotation for (dis)satisfaction with current insulin delivery device:

Now I'm on insulin, but I'm satisfied with this pen because I can use it anytime, even at work, and even

on the utility pole because I did it once when I forgot to take it, and then I carry it with me everywhere, so I could take up there too. (man, 70 years old)

Who's satisfied with this? (laughs uncomfortably) No one loves it. Well, ok, if the tissue isn't damaged, then maybe you can inject it painlessly. The problem here is that those who need to inject it many times, those will feel that small needle painful too. (woman, 44 years old)

Cluster Analysis and Identification of Diabetes Patient Groups in the Light of Qualitative Results

Four patient groups were outlined based on the results of the qualitative analysis, but we wanted to verify these with the help of a quantitative procedure. We decided to use cluster analysis as a quantitative method. In such a case, it is possible to check the similarities between groups of texts. However, as a definitional step, we had to distinguish classical cluster analysis from clustering as a text-mining technique. More specifically, the data sources are text-based in this case. Therefore, the text-based data sources were transformed into quantitative data to perform statistical operations. Data were analyzed using hierarchical cluster analysis and Ward's method, as well as using squared Euclidean distances. We decided to apply this strategy because cluster analysis techniques help to summarize and organize the text corpora, while Ward's method can be used in the case of a small sample and helps to avoid information loss. The number of clusters used for further analyses was determined by considering the values of the coefficients, the dendrogram and the number of elements in the groups. On this basis, the 4-cluster solution was used for further analyses because the distribution of the number of patients appeared to be most evenly distributed in this case. The determined cluster numbers and the number of individuals in the clusters are shown in Table 4. However, it is important to highlight that cluster analysis was presented as a complementary procedure to qualitative data processing and evaluation, ie, as an analytical strategy in the present research.

Table 4
Determined Cluster Numbers and Names of Groups during the Use of Ward's Method

Clusters	Name of Diabetes Patient Groups	N	%
Cluster I	Vulnerable Personality	16	32%
Cluster II	Ambivalent	18	36%
Cluster III	Effective Self-Managers	14	28%
Cluster IV	Somatizing	2	4%
Total	4	50	100%

The variables included in the analysis were *acquired control, long-term coping, attitude to insulin use, openness to new technologies, evaluation of treatment, and emotional response*. In the next step, we checked which groups are homogeneous in terms of the variables by also considering the results of Ward's method. Where the homogeneity of the groups was found to be low, it was presumably due to the large distances between the values of the group members. To check whether there were significant differences between the groups in terms of the examined variables a one-way analysis of variance was applied. To determine which differences were observed between which clusters, the Games-Howell *post hoc* test was performed. The results showed significant differences along the 4 clusters in the variables *emotional response to disease, long-term coping, attitude to insulin use, and openness to new technologies*. Based on the results of the variable *negative emotional responses*, there is a significant difference between the variances $F(3,46) = 55.293$, $MSE = 3.785$, $p < .001$. For *trivialization* as an emotional reaction variable, the variances

were also significantly different $F(3,46) = 3.255$, $p = .005$. Looking at the test scores, the occurrence of minimization differs significantly between the groups $F(3,5.653) = 7.763$, $p = .02$. Within the category of successful long-term coping, the results of the variable *personalization* showed a significant difference $F(3,46) = 3.166$, $MSE = 6.162$, $p = .033$. Within the category of unsuccessful long-term coping, the variances for the variable *defense mechanisms* were significantly different $F(3,46) = 3.333$, $p = .027$. Looking at the test scores, there was a trend level difference in means $F(3,4.720) = 4.447$, $p = .076$. In Welch's t-test, a marginally significant difference was observed by only one variable. For the variable *insulin as a rescuer*, the variances were significantly different $F(3,46) = 4.864$, $p = .005$. For the test results, there was a marginally significant difference $F(3,5.747) = 4.495$, $p = .059$. For the variable *rejection of new technologies*, there was a marginally significant difference between variances $F(3,46) = 2.760$, $MSE = 1.996$, $p = .053$. The complex results of comparisons of the groups are shown in Table 5.

Table 5
Games-Howell Post Hoc Test of Multiple Comparisons

Dependent Variable	(I) Ward Method-group	(J) Ward Method-group	Mean Difference (I-J)	Standard Deviation	Significance
Negative emotional responses	Vulnerable Personality	Ambivalent	4.181*	.668	$p < .001$
	Vulnerable Personality	Effective Self-Managers	6.554*	.712	$p < .001$
	Ambivalent	Effective Self-Managers	2.373*	.693	$p = .001$
Trivialization as emotional responses	Vulnerable Personality	Ambivalent	-3.868*	.708	$p < .001$
	Ambivalent	Effective Self-Managers	3.698*	.734	$p = .001$
	Ambivalent	Somatizing	4.556*	1.535	$p = .004$
Successful long-term coping: Personalization	Ambivalent	Effective Self-Managers	2.190	.885	$p = .057$
Unsuccessful long-term coping: defense mechanisms	Vulnerable Personality	Ambivalent	-1.104	.412	$p = .066$
Insulin as a rescuer	Vulnerable Personality	Effective Self-Managers	1.714*	.578	$p = .01$
Rejection of new technologies	Vulnerable Personality	Effective Self-Managers	1.473*	.517	$p = .052$

Note.

The mean difference is significant at the level .05 level.

According to the cluster analysis, 4 groups of patients were identified. These groups were comprehensively characterized along the measured variables and the codes, and they were also interpreted in accordance with the experiences of qualitative analysis. These 4 groups were named by the research team as the following: *vulnerable personality, ambivalent, effective self-managers, and somatizing*. Patients' distinguishing features according to cluster and thematic analysis are summarized below.

Vulnerable personality: The name of the patient group *vulnerable personality* refers to individuals who

become personally vulnerable as a result of post-traumatic stress disorder. More precisely, reactions triggered by a series of losses and negative life events can develop into chronic stress in the long-term and make it difficult to do self-care for diabetes mellitus successfully. Results showed that in this group of patients, long-term coping is characterized by the use of emotion-focused coping strategies. Individuals in the sample gave the insulin a rescuer connotation so their adherent behavior is mainly organized around glucose monitoring and insulin dosing. However, among the 4 groups, they are the most dismissive of

new diabetes technologies.

Ambivalent: For patients in the *ambivalent* group, the perception of a serious health threat induces strong anxiety, which may be countered by defense mechanisms (e.g., denial, trivialization). For some of them, these defenses presumably aim to protect the ego; therefore, from medical, health professionals' point of view it is almost inconceivable that a patient is unwilling to change their attitude towards diabetes management even if they are in a severe condition (e.g., after a foot amputation or severe hypoglycemic crisis). The *ambivalent* type of patient prefers personalization as a diabetes-specific coping strategy, which meant to manipulate different insulin doses to cope with strict and rigid diabetes therapy. According to our results, the *ambivalent* patient type made the least effort to perform self-management tasks. Their attitude towards new insulin administration technologies is mainly neutral/indifferent.

Effective self-managers: Individuals in the *effective self-managers* group are able to perform diabetes self-management tasks. Patients belonging to this group mostly report relatively stable blood sugar values and metabolism, as well as a low number or absence of hyper- and hypoglycemic states. Their attitude towards insulin therapy is positive, and they are the least characterized by insulin as a rescuer attitude. Based on the results, the long-term coping style of *effective self-managers* is a task-focused approach. Most of them are task-oriented, while those who have a higher self-efficacy often use personalization as a diabetes-specific coping strategy to manage challenges caused by illness. However, in contrast to the *ambivalent* group, personalization here does not mean avoiding or manipulating the strict therapeutic regime of diabetes, but rather, the adoption of adequate treatment decisions in accordance with medical recommendations and the individual's own lifestyle and living circumstances. In addition, this patient type is curious and open to new insulin administration technologies.

Somatizing: The smallest group was the *somatizing* group. Somatization is a term used in psychology and psychiatry, and it refers to the manifestation of psychological distress through the presentation of physical symptoms.⁴⁵ These patients can be recognized mainly by their hostile, desperate, sceptical, and sarcastic comments, which are often accompanying the negative emotional reactions they are trying to hide. These interviewees often refused to participate in the study or dropped out mostly because they were

so touched by their previous memories about diabetes that they asked the interviewer if they could quit the interview. Their attitudes toward the introduction of insulin therapy are often linked to an experience of difficulty and personal failure in diabetes self-care, which is often accompanied by guilt, anger and shame (stigma). According to our results, the diabetes stories of these patients are mostly about the symptoms and the emotional reactions caused by the diabetes symptoms. It is important to note that patients without clearly identifiable diabetes symptoms essentially "create" their own symptoms. More precisely, it can be observed that the majority of them exhibit a behavior similar to that of somatic patients. The *somatizing* group of patients consider insulin rather ineffective and their diabetes-specific coping strategy is mostly emotion-focused. During the semi-structured interviews, they rejected topics related to new insulin delivery technologies.

DISCUSSION

The objective of our qualitative study was to explore T2DM patients' perceptions, treatment expectations and behavioral aspects related to diabetes self-management. During the thematic analysis and cluster analysis of the data, we found 4 main topics with significant differences in responses of T2DM patients. The first main topic with significant differences in responses was *emotional response to disease*. Complex analysis revealed that the emotional correlates dominated a significant proportion of responses from insulin-treated T2DM patients. More precisely, negative emotions (e.g., despair, fear, sadness, disappointment, anger, etc) were dominant in the texts of the interviews. Most often, they centered around dissatisfaction with the therapy and the progressive nature and management of the disease. The results are consistent with previous studies.^{14,30,46,47} According to Stuckey and Peyrot's⁴⁶ literature review and secondary analysis of qualitative data, DM patients often experience negative emotions, which can mainly be organized around the characteristics of hypoglycemia, diabetes complications and DM treatment. Moreover, defense mechanisms might lead to lower treatment adherence and negatively impact physical health.^{30,46}

A particular type of emotional response to DM was trivialization. This reaction, coded as an emotional response, could legitimately also be classified as a psychological defense mechanism; however, we interpreted long-term coping mechanisms in terms of

behavior and problem-solving; in this case, the feeling of trivialization as a coding unit could be interpreted as emotional burnout caused by the exhaustion associated with the acceptance and management of DM. The latter statement is consistent with previous research findings, where trivialization was also observed as an emotional response to diabetes.^{22,30,46} Our findings align with those of another study which sought to identify DM patients with more problematic self-management and found that 2 patient groups named *bitter* and *overwhelmed* are more frequently treated with insulin, while the *overwhelmed* group seems to experience feelings of depression more frequently and reports being less satisfied with their treatment.⁴⁰ Furthermore, negative emotions were dominant in the emotional responses of T2DM patients treated with insulin participating in this study possibly due to inherently lower self-efficacy.⁸ The latter statement also should be verified by objective tests in the future.

Based on the results of our thematic analysis, the second main topic with significant differences in responses was *long-term coping strategies*. Personalization as a long-term coping strategy was present in the majority of DM patients. Because the diagnosis of DM and the introduction of treatments may trigger a temporary loss of psychological balance among diabetes patients, ie, they may experience the process as a kind of crisis, the only remaining option for them to exercise control may be to overcome the situation, adapt treatment guidelines to their individual lifestyle and experiment with dietary prescriptions and insulin dosing as well as monitoring blood glucose levels.^{17,28,46} According to our findings, personalization may predict not only control but also long-term coping capacity. Those who were able to learn from the trials and experiments with optimal blood glucose levels and medical recommendations received during personalized therapy; for example, they were able to manage their DM better and could later develop new attitudes towards the disease and treatments. These results align with previous research that found that some T2DM patients are able to accept their illness over time and diabetes becomes a normalized state of their being.⁴⁶ Furthermore, when examining long-term coping, it is necessary to consider which areas are most affected by adaptation – the development of adherent behavior to complex therapies, the incorporation of new behaviors and habits into the previous lifestyle, or the absorption of negative emotions connected to this chronic disease.⁸ When experiencing negative

emotions, some patients used defense mechanisms in the process of emotion regulation and coping with negative feelings. Especially those, who find it difficult to cope with DM and its management, and instead of active coping, they prefer to distance themselves from the issue or subconsciously gain the strength to face it. As previously stated in the results, this is essentially a maladaptive coping style if it persists for an extended period and becomes a dominant one instead of restoring the altered self-image and life situation. It is important to note that more than half of the patients in the sample used defense mechanisms, highlighting the importance to explore coping styles in the future when providing psychological support to DM patients. This step would reveal not only the psychological resources of the particular patient but also their fixed problem-solving patterns. It is well-known that when patients are emotionally overwhelmed, they tend to respond to diabetes as a disease and its management involves avoidance behaviors and emotion-focused coping styles.⁴⁷ In addition, elderly patients with DM are more prone to prioritize emotion-focused coping styles,^{24,48} which could also explain our findings.

The third main topic with significant differences in responses was *attitude to insulin use*. Our findings revealed 2 different attitudes towards insulin: fears about taking insulin and insulin as a rescuer. Our results can be explained in several ways. Primarily from the patients' perspective, the introduction of insulin therapy, and potentially its intensification, requires additional learning processes which are also influenced by a number of personal, situational, and social/cultural factors. This uncertainty creates tension that may generate fear and doubt in patients. Situational control, the side effects of insulin use, memories of previous inconvenient medical procedures, and the pain experienced during insulin delivery all play a critical part in shaping attitudes toward treatment. This finding is consistent with the results of earlier studies that underline the high prevalence of negative attitudes towards insulin among patients with DM.^{16,17,19,32,46} In the interviews, DM patients on intensive insulin therapy were more likely to be afraid of hypoglycemia and diabetes complications and they also reported greater distress, which is in line with findings reflected in previous studies.^{10,16,17,46} It also has been shown that patients' attitudes towards insulin are mostly influenced by their previously formulated beliefs about insulin therapy (e.g., insulin is fattening). These beliefs may have a significant impact

on patients' attitudes and openness to new insulin delivery technologies, which also may be influenced by previous experience and the successful integration of self-management habits into their lifestyle.

Many T2DM patients consider insulin to be the preferred treatment for improving their well-being and slowing down the progression of complications. On the other hand, the introduction of insulin also provides them with relief from the rigid constraints of medical nutrition therapy used in conjunction with lifestyle therapy, and a more liberal attitude towards the quantity of food consumed. This attitude to insulin use was coded as insulin as a rescuer attitude. To some extent, this attitude also reflects the personalization strategy observed in long-term coping, as well as the need to regain a sense of control. It is important to note, that in contrast to the previous category, the results indicate that this category shows a positive attitude; however, this does not always imply benefits in terms of blood glucose levels and improved well-being; rather, it refers to the way in which patients can manipulate the often strict and rigid diabetes therapy with different insulin doses. This phenomenon is well supported by previous findings, namely, that professionals are trying to emphasize acceptable blood glucose levels while patients' primary goals are to find ways to accept and live with the disease.^{4,13,46} Adherence to medical nutrition therapy and factors linked to changes in dietary habits also imply a deterioration in the quality of life among patients with diabetes,⁴⁹ so they look at insulin use as a way to contradict these external expectations to assess their quality of life as better, which may explain the association of insulin with "rescue."

The fourth main topic with significant differences in responses was *openness to new technologies*. According to our results, 42% (N=21) of the DM patients participating in the interviews were satisfied with their current insulin delivery device, while 46% (N=23) expressed their aversion to using needles. At the same time, openness to new insulin administration technologies can be detected in 20% (N=10) of the patient sample. These findings show similarity with the results of an observational study which found that insulin-treated T2DM patients in 8 European countries were less satisfied with their diabetes treatment than people who received only lifestyle therapy or oral blood glucose lowering agents.⁵⁰ Nevertheless, this is a contradictory finding because, whereas the majority of DM patients report being less satisfied with their diabetes therapy and insulin delivery pens, only 20%

are open to new insulin delivery devices. This may be explained by the fact that the average age of the individuals in the sample was 65 years, indicating that they belonged to an older age group and had lived with their DM for a significantly longer period of time; therefore, they may be less open to new technologies due to lower levels of self-confidence, overload from diabetes therapy care and other health issues, which can take up a significant portion of their psychological resources, thereby reducing their willingness to adopt new insulin delivery technologies. In addition, the availability of these technologies (both physical and financial), their ease of use, perceived usefulness and the minimal occurrence of side effects may also be important factors. For instance, individuals in the sample expect new developments that would make devices easier to use. Patients expect new technology to allow for discreet insulin application in social spaces, as well as to have a low number of side effects. These findings are similar to the results of previous studies, which outlined that one of the conditions for openness to new technologies is the ease of use and unobtrusive application in social spaces.^{19,35,50} In the present study, some also complained that the current technological devices for blood glucose monitoring and the needle and pen used for insulin delivery are not environmentally friendly. This aspect should also be considered when developing new insulin delivery devices.

The results of the qualitative research were supplemented with quantitative calculations, allowing us to determine which interview responses showed significant differences. We identified 4 groups of patients – *vulnerable personality*, *ambivalent*, *effective self-managers*, and *somatizing*. Previous studies also have described patient behavior differences in terms of self-management.^{22,38-40} Our findings are consistent with the results of Alexandre et al.³⁸, Vég et al.³⁹, and the DIABASIS⁴⁰ studies. Based on these conclusions, the success of diabetes patients' self-management in the long-term significantly depends on the psychological and behavioral characteristics of the individuals. At the same time, as highlighted by all 3 studies mentioned in our introduction section, there is a group of patients who reported difficulties in living with T2DM and with the self-management of the disease. According to the DIABASIS study,⁴⁰ the most problematic patients are the *bitter* and *overwhelmed* patient groups who experience significantly more distress during diabetes treatment. In the present study we also identified

2 groups of patients (*vulnerable personality* and *somatizing* groups) who exhibited greater distress related to T2DM treatment, inadequate coping skills and lower levels of adherent behavior over the long-term. Moreover, these individuals found difficult to successfully engage self-care for diabetes mellitus.

The current and previous research findings suggest that T2DM patients require support in managing their diabetes – on the one hand, to maintain successful behaviors and long-term motivation, and on the other, to develop an emotional commitment to therapy, which is not only the basis for achieving adherent behavior and profound changes but also for integrating diabetes into their personal identity and successfully coping with the disease.

Strengths and Limitations

One of the main advantages of our study is that we used qualitative methods that can help answer questions quantitative research may not be able to answer adequately. The results of the qualitative analysis also were verified with the help of quantitative procedures. Additionally, we believe that by paying more attention to patients' subjective interpretations and ideas, as well as investigating their treatment experiences, healthcare professionals and researchers can improve their understanding of medical care during T2DM. We took a step forward and based on our findings, we aimed to provide a comprehensive summary of the types of T2DM patients that are easily identifiable in patient care. Another strength of the study is that we analyzed interview scripts from a total of 50 patients with diabetes, ensuring a proportionate gender and age distribution. It is important to stress that the analysis of the subject of this study left a number of questions open (e.g., no personality tests were included, no projective measurement tools were used, and no medical records were included, which could have provided a more objective picture, etc). Moreover, certain aspects require a more detailed study than the one described here (e.g., exploring coping strategies using objective measurement tools, using a diabetes distress scale, screening for depression, etc). We consider it an advantage that the research could be carried out on a specific patient sample that has received little attention by qualitative scholars not only at a national level but also, without any exaggeration, at the international level.

CONCLUSIONS

The results of the research showed that the main

differences in the behavioral characteristics of insulin-treated T2DM patients were their emotional attitudes toward DM and the treatment regimen. One can argue that all individuals experienced at least some temporary state of destabilization and disorganization during the course of their diabetes. Another important observation is that achieving an appropriate level of adherence can often be hindered by defense mechanisms, which are mostly response patterns to anxiety due to a reduced sense of control and lack of knowledge. Another key factor is their expectations about insulin therapy that may not only explain adherence to therapy but can also predict openness to new insulin delivery technologies. Overall, it can be said that the patient's ability to adapt to the new lifestyle required to manage diabetes and the level of emotional commitment to self-care is decisive in their attitudes towards illness and treatment. Attitudes toward insulin and individual experience with insulin treatment are also decisive in how someone can cope with their illness over time. In conclusion, knowing the individual parameters that influence the self-management of insulin-treated T2DM patients may provide an opportunity for physicians and healthcare professionals to identify typical behaviors and reactions in this patient population more easily. This would broaden the knowledge of chronic patient care professionals, allowing them to develop more complex and customized treatment plans, including patient responsibility.

Human Subjects Approval Statement

This study was approved by the Human Investigation Review Board at the University of Szeged, Albert Szent-Györgyi Health Centre, Hungary (Approval No. 4324) September 13, 2018. The study was conducted according to the guidelines of the Declaration of Helsinki.

Conflict of Interest Disclosure Statement

The authors report no conflicts of interest in this work.

Acknowledgements

We are grateful to the Diabetes Unit, 1st Department of Internal Medicine, Albert Szent-Györgyi Health Centre, University of Szeged, for providing us the opportunity to collect data during the qualitative research. We are thankful to the individuals who participated in the semi-structured interviews and they honestly shared with us their feelings and experiences about chronic disease and its treatment.

REFERENCES

1. Chatterjee S, Khunti K, Davies MJ. Type 2 diabetes. *Lancet*. 2017;389(10085):2239-51. [https://doi.org/10.1016/s0140-6736\(17\)30058-2](https://doi.org/10.1016/s0140-6736(17)30058-2)
2. Davies MJ, Aroda VR, Collins BS, et al. Management of Hyperglycemia in Type 2 Diabetes, 2022. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*. 2022;45(11):2753-86. <https://doi.org/10.2337/dci22-0034>
3. Asmat K, Dhamani K, Gul R, Froelicher ES. The effectiveness of patient-centered care vs. usual care in type 2 diabetes self-management: A systematic review and meta-analysis. *Front Public Health*. 2022;10:994766. <https://doi.org/10.3389/fpubh.2022.994766>
4. Powers MA, Bardsley J, Cypress M, et al. Diabetes Self-Management Education and Support in Type 2 Diabetes: A Joint Position Statement of the American Diabetes Association, the American Association of Diabetes Educators, and the Academy of Nutrition and Dietetics. *J Acad Nutr Diet*. 2015;115(8):1323-34. <https://doi.org/10.1016/j.jand.2015.05.012>
5. Rosenbek Minet LK, Lønvig EM, Henriksen JE, Wagner L. The experience of living with diabetes following a self-management program based on motivational interviewing. *Qual Health Res*. 2011;21(8):1115-26. <https://doi.org/10.1177/1049732311405066>
6. Hill-Briggs F. Problem solving in diabetes self-management: a model of chronic illness self-management behavior. *Ann Behav Med*. 2003;25(3):182-93. https://doi.org/10.1207/s15324796abm2503_04
7. Shirazian S, Crnosija N, Weinger K, et al. The self-management experience of patients with type 2 diabetes and chronic kidney disease: A qualitative study. *Chronic Illn*. 2016;12(1):18-28. <https://doi.org/10.1177/1742395315614381>
8. van Smoorenburg AN, Hertroijs DFL, Dekkers T, et al. Patients' perspective on self-management: type 2 diabetes in daily life. *BMC Health Serv Res*. 2019;19(1):605. <https://doi.org/10.1186/s12913-019-4384-7>
9. Rivera E, Corte C, Steffen A, et al. Illness Representation and Self-Care Ability in Older Adults with Chronic Disease. *Geriatrics (Basel)*. 2018;3(3):45. <https://doi.org/10.3390/geriatrics3030045>
10. Dimova ED, Ward A, Swanson V, Evans JMM. Patients' Illness Perceptions of Type 2 Diabetes: A Scoping Review. *Curr Diabetes Rev*. 2019;15(1):15-30. <https://doi.org/10.2174/1573399814666171227214845>
11. Heijmans M, De Ridder D. Structure and Determinants of Illness Representations in Chronic Disease: A Comparison of Addison's Disease and Chronic Fatigue Syndrome. *J Health Psychol*. 1998;3(4):523-37. <https://doi.org/10.1177/135910539800300406>
12. Látos M, Lázár G, Csabai M. The reliability and validity of the Hungarian version of the Brief Illness Perception Questionnaire. *Orv Hetil*. 2021;162(6):212-18. <https://doi.org/10.1556/650.2021.31999>
13. Bruno BA, Choi D, Thorpe KE, Yu CH. Relationship Among Diabetes Distress, Decisional Conflict, Quality of Life, and Patient Perception of Chronic Illness Care in a Cohort of Patients With Type 2 Diabetes and Other Comorbidities. *Diabetes Care*. 2019;42(7):1170-77. <https://doi.org/10.2337/dc18-1256>
14. Hara Y, Hisatomi M, Ito H, et al. Effects of gender, age, family support, and treatment on perceived stress and coping of patients with type 2 diabetes mellitus. *Biopsychosoc Med*. 2014;8:16. <https://doi.org/10.1186/1751-0759-8-16>
15. Adu MD, Malabu UH, Malau-Aduli AEO, Malau-Aduli BS. Enablers and barriers to effective diabetes self-management: A multi-national investigation. *PLoS One*. 2019;14(6):e0217771. <https://doi.org/10.1371/journal.pone.0217771>
16. Gonder-Frederick LA, Shepard JA, Grabman JH, Ritterband LM. Psychology, technology, and diabetes management. *Am Psychol*. 2016;71(7):577-89. <https://doi.org/10.1037/a0040383>
17. Holmes-Truscott E, Browne JL, Ventura AD, et al. Diabetes stigma is associated with negative treatment appraisals among adults with insulin-treated Type 2 diabetes: results from the second Diabetes MILES - Australia (MILES-2) survey. *Diabet Med*. 2018;35(5):658-62. <https://doi.org/10.1111/dme.13598>
18. Hart PL, Grindel CG. Illness representations, emotional distress, coping strategies, and coping efficacy as predictors of patient outcomes in type 2 diabetes. *J Nurs Healthc Chronic Illn*. 2010;2(3):225-40. <https://doi.org/10.1111/j.1752-9824.2010.01062.x>
19. Ellis K, Mulnier H, Forbes A. Perceptions of insulin use in type 2 diabetes in primary care: a thematic synthesis. *BMC Fam Pract*. 2018;19(1):70. <https://doi.org/10.1186/s12875-018-0753-2>

20. Tourkmani AM, Alharbi TJ, Rsheed AMB, et al. Hypoglycemia in Type 2 Diabetes Mellitus patients: A review article. *Diabetes Metab Syndr*. 2018;12(5):791-94. <https://doi.org/10.1016/j.dsx.2018.04.004>
21. Whittemore R, D'Eramo Melkus G, Grey M. Metabolic control, self-management and psychosocial adjustment in women with type 2 diabetes. *J Clin Nurs*. 2005;14(2):195-203. <https://doi.org/10.1111/j.1365-2702.2004.00937.x>
22. Yasui-Furukori N, Murakami H, Otaka H, et al. Coping behaviors and depressive status in individuals with type 2 diabetes mellitus. *Ann Gen Psychiatry*. 2019;18:11. <https://doi.org/10.1186/s12991-019-0235-5>
23. Folkman S, Lazarus RS. An analysis of coping in a middle-aged community sample. *J Health Soc Behav*. 1980;21(3):219-39. <https://doi.org/10.2307/2136617>
24. Karlsen B, Bru E. Coping styles among adults with Type 1 and Type 2 diabetes. *Psychol Health Med*. 2002;7(3):245-59. <https://doi.org/10.1080/13548500220139403>
25. Serlachius A, Frydenberg E, Northam E, Cameron F. A qualitative study exploring coping strategies in youth with type 1 diabetes. *Children Australia*. 2011;36(3):144-52. <https://doi.org/10.1375/jcas.36.3.144>
26. Burns RJ, Deschênes SS, Schmitz N. Associations between coping strategies and mental health in individuals with type 2 diabetes: Prospective analyses. *Health Psychol*. 2016;35(1):78-86. <https://doi.org/10.1037/hea0000250>
27. Murakami H, Yasui-Furukori N, Otaka H, et al. Coping styles associated with glucose control in individuals with type 2 diabetes mellitus. *J Diabetes Investig*. 2020;11(5):1215-21. <https://doi.org/10.1111/jdi.13225>
28. Knowles SR, Apputhurai P, O'Brien CL, et al. Exploring the relationships between illness perceptions, self-efficacy, coping strategies, psychological distress and quality of life in a cohort of adults with diabetes mellitus. *Psychol Health Med*. 2020;25(2):214-28. <https://doi.org/10.1080/13548506.2019.1695865>
29. Cheng C, Yang CY, Inder K, Chan SW. Illness Perceptions, Coping Strategies, and Quality of Life in People With Multiple Chronic Conditions. *J Nurs Scholarsh*. 2020;52(2):145-54. <https://doi.org/10.1111/jnu.12540>
30. Martino G, Caputo A, Bellone F, et al. Going Beyond the Visible in Type 2 Diabetes Mellitus: Defense Mechanisms and Their Associations With Depression and Health-Related Quality of Life. *Front Psychol*. 2020;11:267. <https://doi.org/10.3389/fpsyg.2020.00267>
31. Marchini F, Caputo A, Napoli A, et al. Chronic Illness as Loss of Good Self: Underlying Mechanisms Affecting Diabetes Adaptation. *Mediterranean Journal of Clinical Psychology*. 2018;6(3):1-25. <https://doi.org/10.6092/2282-1619/2018.6.1981>
32. Davoudi Z, Chouhdari A, Mir M, Akbarian F. Attitude and Compliance with the Onset of Insulin Therapy in Patients with Type 2 Diabetes. *Shiraz E-Med J*. 2020;21(6):e95408. <https://doi.org/10.5812/semj.95408>
33. Kalra S, Bajaj S, Sharma SK, et al. A Practitioner's Toolkit for Insulin Motivation in Adults with Type 1 and Type 2 Diabetes Mellitus: Evidence-Based Recommendations from an International Expert Panel. *Diabetes Ther*. 2020;11(3):585-606. <https://doi.org/10.1007/s13300-020-00764-7>
34. Kubiak T, Priesterroth L, Barnard-Kelly KD. Psychosocial aspects of diabetes technology. *Diabet Med*. 2020;37(3):448-54. <https://doi.org/10.1111/dme.14234>
35. Kulzer B, Heinemann L, Roos T. Patients' Experience of New Technologies and Digitalization in Diabetes Care in Germany. *J Diabetes Sci Technol*. 2022;16(6):1521-31. <https://doi.org/10.1177/19322968211041377>
36. Rutten G, Alzaid A. Person-centred type 2 diabetes care: time for a paradigm shift. *Lancet Diabetes Endocrinol*. 2018;6(4):264-66. [https://doi.org/10.1016/s2213-8587\(17\)30193-6](https://doi.org/10.1016/s2213-8587(17)30193-6)
37. Alexandre K, Campbell J, Bugnon M, et al. Factors influencing diabetes self-management in adults: an umbrella review of systematic reviews. *JBI Evid Synth*. 2021;19(5):1003-118. <https://doi.org/10.11124/jbies-20-00020>
38. Alexandre K, Vallet F, Peytremann-Bridevaux I, Desrichard O. Identification of diabetes self-management profiles in adults: A cluster analysis using selected self-reported outcomes. *PLoS One*. 2021;16(1):e0245721. <https://doi.org/10.1371/journal.pone.0245721>
39. Vég A, Rosenqvist U, Sarkadi A. Self-management profiles and metabolic outcomes in type 2 diabetes. *J Adv Nurs*. 2006;56(1):44-54. <https://doi.org/10.1111/j.1365-2648.2006.03978.x>

40. Mosnier-Pudar H, Hochberg G, Eschwege E, et al. How patients' attitudes and opinions influence self-care behaviours in type 2 diabetes. Insights from the French DIABASIS Survey. *Diabetes Metab.* 2010;36(6 Pt 1):476-83. <https://doi.org/10.1016/j.diabet.2010.08.004>
41. Weller SC, Baer R, Nash A, Perez N. Discovering successful strategies for diabetic self-management: a qualitative comparative study. *BMJ Open Diabetes Res Care.* 2017;5(1):e000349. <https://doi.org/10.1136/bmjdr-2016-000349>
42. Peng X, Guo X, Li H, et al. A Qualitative Exploration of Self-Management Behaviors and Influencing Factors in Patients With Type 2 Diabetes. *Front Endocrinol (Lausanne).* 2022;13:771293. <https://doi.org/10.3389/fendo.2022.771293>
43. McDonald N, Schoenebeck S, Forte A. Reliability and inter-rater reliability in qualitative research: Norms and guidelines for CSCW and HCI practice. *Proc ACM Hum Comput Interact.* 2019;3(CSCW):1-23. <https://doi.org/10.1145/3359174>
44. Joffe H, Yardley L. Content and Thematic Analysis. In Marks D, Yardley L, (Eds). *Research Methods for Clinical and Health Psychology.* Sage Publications 2003:56-68. <https://doi.org/10.4135/9781849209793>
45. Lanzara R, Scipioni M, Conti C. A Clinical-Psychological Perspective on Somatization Among Immigrants: A Systematic Review. *Front Psychol.* 2018;9:2792. <https://doi.org/10.3389/fpsyg.2018.02792>
46. Stuckey H, Peyrot M. Living with diabetes: literature review and secondary analysis of qualitative data. *Diabet Med.* 2020;37(3):493-503. <https://doi.org/10.1111/dme.14255>
47. McCoy MA, Theeke LA. A systematic review of the relationships among psychosocial factors and coping in adults with type 2 diabetes mellitus. *Int J Nurs Sci.* 2019;6(4):468-77. <https://doi.org/10.1016/j.ijnss.2019.09.003>
48. Hoyt MA, Wang AW, Boggero IA, et al. Emotional approach coping in older adults as predictor of physical and mental health. *Psychol Aging.* 2020;35(4):591-603. <https://doi.org/10.1037/pag0000463>
49. Boels AM, Vos RC, Hermans TGT, et al. What determines treatment satisfaction of patients with type 2 diabetes on insulin therapy? An observational study in eight European countries. *BMJ Open.* 2017;7(7):e016180. <https://doi.org/10.1136/bmjopen-2017-016180>
50. Yan M, Or C. A 12-week pilot study of acceptance of a computer-based chronic disease self-monitoring system among patients with type 2 diabetes mellitus and/or hypertension. *Health Informatics J.* 2019;25(3):828-43. <https://doi.org/10.1177/1460458217724580>

Supplement 1

Consolidated Criteria for Reporting Qualitative Research (COREQ) Checklist

Domain 1: Research Team and Reflexivity

Personal Characteristics

1. Interviewer/Facilitator Which author/s conducted the interview or focus group?	The semi-structured interviews were conducted by Andrea Klinovszky. She is a member of the research team.
2. Credentials What were the researcher's credentials? <i>e.g., PhD, MD</i>	Andrea Klinovszky: MSc in Psychology, PhD in Medicine Orsolya Papp-Zipernovszky: Assistant Professor of Psychology, PhD in Psychology, Habilitation in Psychology Viola Sallay: Assistant Professor of Psychology, PhD in Psychology Csaba Lengyel MD: Professor of Internal Medicine, PhD in Medicine Norbert Buzás: Associate Professor of Health Economics
3. Occupation What was the occupation at the time of the study?	The researcher's occupation was PhD student at the time of the study.
4. Gender Was the researcher male or female?	Female.
5. Experience and training What experience or training did the researcher have?	The researcher obtained a master's degree in psychology, so she has previous experience in interviewing. At the beginning of the research, the interviewer participated in the training on technical aspects of the semi-structured interviews and there was constant supervision available for her during the research period.

Relationship with participants

6. Relationship established Was a relationship established prior to study commencement?	No relationship with the participants was established prior to the study.
7. Participants knowledge of the interviewer What did the participants know about the researcher? <i>e.g., personal goals, reasons for doing the research</i>	Participants were informed at the beginning of the interview that the researcher was conducting her research as part of her PhD studies. The research was approved by the Regional Research Ethics Committee of the University of Szeged as a part of a university project.
8. Interviewer characteristics What characteristics were reported about the interviewer/facilitator? <i>e.g., Bias, assumptions, reasons and interests in the research topic</i>	The interviewer as a member of the research team put focus on exploring self-care activities, expectations and experiences of treatment among insulin treated type 2 diabetes patients. The interviewer carried out the research as part of her doctoral studies, so her interest was to carry out the most accurate research with methodologically correct steps.

Domain 2: Study design

Theoretical framework

9. Methodological orientation and Theory What methodological orientation was stated to underpin the study? <i>e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	In this current qualitative study, researchers decided to use thematic content analysis as a theoretical framework. Thematic content analysis is a method which helps to identify, analyze and report patterns (themes) within data. Moreover, researchers who use this method can interpret various aspects of the research topic through inductive analysis process. It is important to highlight that thematic content analysis in contrast to grounded theory or IPA is not theoretically bounded. Thematic analysis is a realist method, which reports the experiences, interpretations, and reality of patients. Furthermore, it can be also a method to help identify the ways individuals make sense of their experiences.
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Participants selection

10. Sampling How were participants selected? <i>e.g., purposive, convenience, consecutive, snowball</i>	Interviewees were selected with stratified convenience sampling and snowball sampling.
11. Method of approach How were participants approached? <i>e.g., face to face, telephone, mail, email</i>	During data collection, patients who appeared in the routine patient care at the 1st Department of Internal Medicine, Albert Szent-Györgyi Health Centre, University of Szeged were personally informed about the research by the interviewer. Patients participated in the interview study on a voluntary basis. During snowball sampling followed by a telephone inquiry, the interviewer and the interviewee agreed on the date and details of the face-to-face interview.
12. Sample size How many participants were in the study?	The final sample consisted of 50 insulin treated patients who were diagnosed with type 2 diabetes.
13. Non-participation How many people refused to participate or dropped out? Reasons?	During the recruitment of patients, 20 people rejected the participation in the study. Five subjects dropped out of the sample because they were so touched by their previous memories about diabetes that they asked the interviewer if they could quit the interview.

Setting

14. Setting of data collection Where was the data collected? <i>e.g., home, clinic, workplace</i>	Data were collected at the 1st Department of Internal Medicine, Albert Szent-Györgyi Health Centre, University of Szeged. In addition, data collection happened in the patients' homes by participants who took part in the research with the help of snowball sampling.
15. Presence of non-participants Was anyone else present besides the participants and researchers?	No, during the data collection there was not anyone else present besides the participants and the researcher.
16. Description of sample What are the important characteristics of the sample? <i>e.g., demographic data, date</i>	The important characteristics of the sample are as follows: >18 years of age; diagnosed with T2DM; use of insulin therapy; voluntary participation in the study. Participants were notified in detail about the purpose of the study and that their information would be kept strictly confidential and anonymous. The patients were also informed about their right to discontinue the interview and that there would be no consequences whatsoever to their participation.

Data collection	
17. Interview guide Were questions, prompts, guides provided by the authors? Was it pilot tested?	The final interview guide is appended to the manuscript. The semi-structured interview questions were tested with a pilot study consisting of 10 participants. This was necessary in order to make sure that the participants understood the questions and that the construction of the semi-structured interviews was consistent with the participants' thinking. In addition, we tried to approach the research topic in the most complex way possible; so, when some comments or questions that we had not thought of before recurred, we incorporated them into the final set of questions as lessons learned from the pilot research.
18. Repeat interviews Were repeat interviews carried out? If yes, how many?	No, repeat interviews were not carried out.
19. Audio/visual recording Did the research use audio or visual recording to collect the data?	All interviews were audio-recorded (with accompanying field notes collected by the interviewer) and the recordings were transcribed.
20. Field notes Were field notes made during and/or after the interview or focus group?	Yes, field notes were made during and after the interviews. The interviewer recorded self-reflections, non-verbal, meta communicative signs of the subjects (e.g., facial expressions, gestures, proxemics etc), and any important information related to the research that the patient provided after the recorder was turned off (e.g., emotions - expressing gratitude for being listened to; concerns).
21. Duration What was the duration of the interviews or focus group?	The face-to-face semi-structured interviews lasted 1 hour 30 minutes on average.
22. Data saturation Was data saturation discussed?	Yes, the data saturation was discussed in the Methods section of our manuscript. We acknowledged that our sampling continued until sufficiency was achieved. We decided to follow the rich and thick data method (rich as quality and thick as quantity).
23. Transcripts returned Were transcripts returned to participants for comment and/or correction?	We did not return transcripts to participants for comment or correction because they were anonymized at the time of transcription.
Domain 3: Analysis and findings	
24. Number of data coders How many data coders coded the data?	The texts of the transcripts were analyzed by Andrea Klinovszky, Orsolya Papp-Zipernovszky and by an independent encoder who was not a member of the research team. In addition, during the qualitative data analysis we used the Analysis Software for Content in Qualitative Research (ATLAS.ti 8).
25. Description of the coding tree Did authors provide a description of the coding tree?	We did not provide a description of the coding tree. The coding tree represents the full analysis, which would exhaust the essence and scope of the focal point of the current manuscript. We could provide you the final code table if it is necessary.
26. Derivation of themes Were themes identified in advance or derived from the data?	The purpose of our qualitative study was to map the insulin treated T2DM patients' diabetes self-management and self-care experiences, their treatment expectations, adherence and quality of life. Hence, the final themes were not identified in advance, but were derived from the data and transcripts of the interviews. In the thematic analysis, the researcher focuses on what the participants say, so themes were identified from the data. We did not use template analysis.
27. Software What software, if applicable, was used to manage the data?	The Analysis Software for Content in Qualitative Research – ATLAS.ti 8 was used to manage the data.
28. Participant checking Did participants provide feedback on the findings?	No, participants did not provide feedback on the findings.
Reporting	
29. Quotations presented Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? <i>e.g., participant number</i>	The quotations of participants were presented to illustrate the themes and the findings. These quotations are provided in the results to illustrate the themes/findings with each quotation identified by gender and age of anonymized participants.
30. Data and findings consistent Was there consistency between the data presented and the findings?	To ensure that the examples are illustrative of the findings, we have provided the most salient quotations from the interview transcripts.
31. Clarity of major themes Were major themes clearly presented in the findings?	In the findings, we clearly presented the major themes, which are collated in Figure 1.
32. Clarity of minor themes Is there a description of diverse cases or discussion of minor themes?	Yes, there is a detailed description of minor themes.