

Comorbidity of eating disorders and depression in T1DM patients: challenges and tasks for dietitian – a pilot study

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Abstract:

The aim of the study: The aim was to assess the occurrence of eating disorders in T1DM patients being under regular diabetologist care, that qualify for a visit to a psychologist and to evaluate possible correlation of eating disorders with symptoms of depression and anxiety in this population.

Subject or material and methods: The study included a selected group of 27 adult patients (55.5% of the group were women) with T1DM under the constant care at the diabetes clinic. The following tools were used: to assess depression and anxiety, we used the Patient Health Questionnaire (PHQ-9) and Centre for Epidemiological Studies Depression Questionnaire (CES-D); EAT-26 assessed eating disorders screening and Mood Disorder Questionnaire (MDQ) – other problems.

Results: Based on the overall assessment of the EAT 26 test as many as 7% of group had a problem, which manifested a high level of concern about dieting, body weight or problematic eating behaviours. Additionally, the 25.9% people reported high depressive. We showed a relationship between eating disorders and depression.

Discussion: There was a similar frequency of eating disorders in the study group compared to other studies and general epidemiological references. People with type 1 diabetes and eating disorders have elevated HbA1c, however, in our study, the mean HbA1c was 6.85% (51 mmol/mol), which indicates an average glycaemia of 150.1 mg/dL (8.33 mmol/l). – fairly good glycemic control. In addition, a correlation between eating disorders and depression has been noted, and patients with type 1 diabetes are very sensitive to both disorders.

Conclusions: People with type 1 diabetes, due to the increased risk of eating disorders or depression, require comprehensive care of a therapeutic team, which should include a diabetologist, psychologist, psychiatrist, diabetes educator, nurse, nutritionist.

type 1 diabetes; eating disorders; diabulimia, eat-26

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INTRODUCTION

Type 1 diabetes mellitus is a chronic disease characterized by an absolute deficiency of insulin secretion, and therefore requires continuous insulin administration – adequate to the quantity and

quality of the food consumed – which requires constant involvement of the patient in solving many complex medical and psychosocial problems [1–3]. In recent years, more and more associations in their guidelines pay additional and special attention to the psychological management of diabetes in addition to the aspects of treatment, lifestyle – diet or physical activity [2,4]. The fact that a coherent attitude of the entire therapeutic team is an important condition for the effectiveness of therapy is emphasized all the more.

People suffering from insulin-dependent diabetes are particularly vulnerable to the development of eating disorders (ED) due to many risk factors associated with the course of the underlying disease, such as: changes in body weight, great emphasis on self-control or focusing on diet [5]. The mere desire to follow a diet already creates problems and guilt associated with deviations from proper nutrition [5]. This then can lead to pathological compensatory actions, which are called disturbed eating behaviour (DEB) and there are studies that indicate that type 1 diabetes is a risk factor for developing these disorders [6–8]. DEB are manifested by restriction of food, binge eating and vomiting, use of laxatives, and excessive exercise that can occur with or without the presence of insulin abuse [8,9].

On the one hand, diabetes have an impact on eating behaviours of the patients, but on the other hand, we must not forget about eating disorders which are comorbid to diabetes, and are connected with impaired control, self-image, body acceptance, abnormal family relationships, etc. – thus existing independently of diabetes.

No matter what the background of ED is, current data in the literature show different rates of the prevalence of ED in people with T1DM [10,11]. However ED are two to three times more common among individuals with Type 1 diabetes compared with the general population [12,13], and subthreshold disturbed eating behaviours are reported in up to 60% of females with Type 1 diabetes [14].

The heterogeneous definitions of DEB make it difficult to assess the prevalence of these disorders among people with diabetes and to find the size of the risk of these disorders coexisting with diabetes and quality of life [10].

The last three years, in the shadow of the Covid-19 pandemic, have shown the growing prob-

lems associated with diabetes, especially problems related to stress, lifestyle changes and restrictions [15,16]. However, from a clinical point of view, the current research results are inconclusive. Some of the results did not show a significant worsening of nutritional problems among children and adolescents [17,18]. However, there have been such analyzes that have shown exacerbation of DEB [19]. Published studies have focused on the younger population of T1DM patients. The research from our unit of the university hospital covered the adult population, but first focused on the aspects of unipolarity (depression) and bipolarity and the identification of possible risk factors related to affective features [20]. During the study, a decision was made to extend the study to include aspects of ED as a pilot assessment of whether such problems apply to our population. The extension of the study is aimed at showing how important it may be to search for the links between the psyche and the diet and the diet and the psyche, and therefore how important a dietician and a psychologist in cooperation with a doctor have to play.

The aim of our study was to assess the occurrence of eating disorders in T1DM patients being under regular diabetologist care and to evaluate possible correlation of eating disorders with symptoms of depression and anxiety in this population.

METHODS

According to the main study protocol the inclusion criteria were a: T1DM for at least a year, having regular diabetes visits (every 3 months, including late complications check every year) age over 18, expressing informed consent to participate in the study by Cyranka et al [20]. Due to the later expansion of the main study to include eating disorders, only 27 patients were included in the pilot study (55.5% of the group were women) – the included persons filled in the forms correctly (there were no missing data) and regularly visited a diabetologist (at least once every 6 months). The study was approved by the Bioethics Committee No. 1072.6120.78.202 of 1 April 2020 after submitting amendments including the addition of an additional EAT-26 questionnaire. The patients received a standardised set of psy-

chological screening tools during regular visit to the clinic or via email when the consultation with their diabetologist was done online due to the pandemic lock down. The patients gave their informed consent to participate in the study.

The following tools were used:

Patient Health Questionnaire (PHQ-9) is an instrument for making criteria-based diagnoses of depressive and other mental disorders commonly encountered in primary care [21,22]. In addition to making criteria-based diagnoses of depressive disorders, the PHQ-9 is also a reliable and valid measure of depression severity [21]. The PHQ-9 assesses several factors that center around the criteria used to professionally diagnose depression according to the current Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and include: Feeling depressed or irritable; Loss of interest or pleasure in doing things; Overeating or loss of appetite; Sleep problems (sleeping too much or having trouble falling or staying asleep); Moving or talking slowly or vice versa, talking fast or restless; You feel like a failure or that you have disappointed your family or yourself; Difficulty concentrating, for example when watching TV or reading a news app; Thinking it would be better if you died or wishing you could hurt yourself in some way [20,23].

Center for Epidemiological Studies Depression Questionnaire (CES-D) is a tool that not only can evaluate whether a person is depressed, but also the severity of the depressive symptoms where ≤ 16 is not depressed to mild depression, 17–23 is moderate, and ≥ 24 is severe [24,25]. The tool collects a patient's rating of how often they have experienced depression-related symptoms, such as restless sleep, poor appetite and feelings of loneliness, over the past week [20,26].

Mood Disorder Questionnaire (MDQ) is a self-administered screening instrument for bipolar disorder composed of three parts: the first part is identify previous hypomanic or manic episodes; the second part regard the simultaneous occur-

rence of symptoms; and the third part assesment influence of the above symptoms [20,27,28]. Polish Version of MDQ was performed by Kiejna et al. 2010 [29].

26-items Eating Attitudes Test (EAT-26) is a commonly used tool to assess eating disorder risk in both clinical and non-clinical settings. The EAT-26 includes a threescales: the "Dieting" scale is characterized by scrutiny of calorie content, carbohydrates – sugar content that is motivated by a desire to be thinner; the "Bulimia and food preoccupation" scale is described by the tendency to purge after meals as well as excessive food-related thinking; the "Oral control" scale which reflects the tendency toward self-control of eating [30].

The legitimacy of the use of tools. The PHQ-9 is a more general tool indicating the probable cause of depression, the CES-D is a precise tool for measuring clinical depression, the MDQ, in turn, measures bipolarity, overall, all tools are complementary and give a broader clinical picture. The severity of symptoms was determined on the basis of the standards for a given tool.

Socio-demographic data were collected in separate questions attached to the survey package.

The PS Imago Pro 8 (version 28, IBM Corporation) was used for statistical analysis. To check if the variables have a normal distribution, the Kolmogorov–Smirnov test was used. The Student-t test and its non-parametric counterpart, the Mann-Whitney U test, were used to analyze quantitative variables in two subgroups. The Pearson correlation and Spearman's rank correlation (nonparametric test) were used for correlation analyses. A p-value < 0.05 was interpreted as statistically significant.

RESULTS

The characteristics of the studied population of patients with type 1 diabetes are presented in Table 1.

Table 1. Characteristics of the study population

	Overall				Females (n=15)	Males (n=12)	p
	Average	SD	Minimum	Maximum	Average and SD	Average and SD	
BMI [kg/m ²]	23.32	5.59	7.97	32.30	23.38 ± 5.58	23.23 ± 5.86	0.945 [^]
Age [years]	31.33	10.68	23.00	68.00	29.5 ± 5.68	32.8 ± 13.46	0.981 [§]
Diabetes duration [years]	17.89	8.06	2.00	38.00	17.00 ± 7.98	18.60 ± 8.33	0.618 [^]
Insulin pump treat duration [years]	10.00	4.49	1.00	18.00	10.18 ± 4.85	9.87 ± 4.37	0.864 [^]
Glycated Hemoglobin at enrolment [%]	6.85	0.76	5.50	8.90	6.60 ± 0.65	7.13 ± 0.81	0.086 [^]
Eating Attitudes Test 26 (EAT-26) total score [points]	8.93	6.96	1.00	33.00	10.25 ± 9.39	7.87 ± 4.22	0.387 [^]
Mood Disorder Questionnaire (MDQ) score [points]	5.37	3.82	0.00	13.00	6.50 ± 4.36	4.47 ± 3.20	0.174 [^]
Center for Epidemiological Studies Depression (CESD) score [points]	13.00	10.67	0.00	40.00	15.25 v 12.79	11.20 ± 8.65	0.337 [^]
Patient Health Questionnaire-9 (PHQ-9) score [points]	6.96	5.89	0.00	19.00	8.33 ± 6.47	5.87 ± 5.36	0.347 [§]

[^] – Student's t-test; [§] – Mann-Whitney U test

The 25.9% people reported high depressive symptoms (CES-D scores >15).

According to the PHQ-9 questionnaire, 25.9% of people have mild depression, 7.4% – moderate depression and 18.5% – moderately severe depression.

Based on the overall assessment of the EAT 26 test as many as 7% (2 people with a score at or above 20 on the EAT-26) of group was problem, which manifested a high level of concern about dieting, body weight or problematic eating behaviors. It was analyzed what other parameters correlated with the overall EAT score as summarized in Table 2.

Table 2. Correlation between EAT-26 score and other parameters.

Variable	r	p
BMI [kg/m ²]	0.122	0.544 [#]
Age [years]	0.184	0.359 [#]
Diabetes duration [years]	0.128	0.525 [#]
Insulin pump treat duration [years]	0.112	0.585 [*]
HbA1c at enrolment [%]	0.197	0.346 [*]
Mood Disorder Questionnaire (MDQ) score [points]	0.027	0.894 [#]
Center for Epidemiological Studies Depression (CESD) score [points]	0.433	0.024 [*]
Patient Health Questionnaire-9 (PHQ-9) score [points]	0.072	0.723 [#]

* – Pearson correlations; # – Spearman correlations

In the further part, it was investigated whether any of the factors in Table 2 correlate with the result of one of the three EAT-26 scales.

Table 3. Spearman correlations between EAT-26 subscales and clinical variables.

Variable	Name of three subscales					
	Dieting		Bulimia and food preoccupation		Oral control	
	r	p	r	p	r	p
BMI [kg/m ²]	0.101	0.616 [#]	0.332	0.091 [#]	-0.229	0.251 [#]
Age [years]	0.361	0.064 [#]	0.117	0.560 [#]	-0.264	0.183 [#]
Diabetes duration [years]	0.249	0.210 [#]	0.195	0.329 [#]	-0.297	0.133 [#]
Insulin pump treat duration [years]	0.233	0.252 [#]	0.257	0.204 [#]	0.143	0.486 [#]
HbA1c at enrolment [%]	0.059	0.778 [#]	0.236	0.256 [#]	-0.025	0.907 [#]
Mood Disorder Questionnaire (MDQ) score [points]	-0.077	0.704 [#]	0.048	0.811 [#]	0.128	0.523 [#]
Center for Epidemiological Studies Depression (CESD) score [points]	0.189	0.346 [#]	0.208	0.298 [#]	0.508	0.007 [#]
Patient Health Questionnaire-9 (PHQ-9) score [points]	0.067	0.740 [#]	0.219	0.273 [#]	0.082	0.684 [#]

– Spearman correlations

Correlation with CESD was found for the EAT-26 global score ($p=0.024$), and after dividing the overall score into three separate scales – the correlation occurred with “Oral Control” scale ($p=0.007$).

DISCUSSION

Our pilot study group (part of a large screening project for type 1 diabetes, depression and bipolarity by Cyranka et al.[20]) focused first on a general analysis of symptom screening in people with suspected eating disorders using the EAT-26 test. In our small sample an eating disorder around 7.0% met diagnostic criteria for an eating disorder, the result was 5 times lower than in the study by Apergi et al (35%) [31]. On the other hand, the average number of points from the test in our sample of adults was 8.93 (SD=6.96) and it was half the result in the Apergi K et al study (mean point=17.3, SD=10.4, n=100) [31]. Lower values were obtained for the EAT-26 total score than in the study by Benioudakis ES et al. 2022 and similarly for variable – gender these values did not differ statistically significantly [32].

However, without doubts eating disorders comorbid to diabetes may have a negative impact on safe diabetic self-care behaviour [33,34]. Adult with T1DM and ED can present irregular eating pattern such as avoiding sweets and

fats, restricting the food they eat and “skipping” meals, to lose weight, or they frequently ingesting a large amount of food and feel guilty, then limiting or omitting insulin. These patients quickly develop diabetic ketoacidosis, one of the most serious acute complications of diabetes, as a consequence of starvation the body begins to burn fat for energy[34]. Further on, it can cause problems with the absorption of macro – and micronutrients, leading to diseases such as malnutrition, anaemia, menstrual disorders in women or other hormonal disorders [35].

People with type 1 diabetes and disordered eating have elevated HbA1c (7,33), however in our study average HbA1c was 6.85% (51 mmol/mol), which indicates an average blood glucose of 150.1 mg/dL (8.33 mmol/L) – fairly good glycaemic control – but a slight excess compared to the result of the Rama Chandran et al. 2021 where HbA1c was 8.7% (72 mmol/mol) for the group with diabetes and diagnosed ED and 7.35 (57mmol/mol) for the group with diabetes only (N=10 T1DM and ED group and N=10 T1DM group) [33].

It is generally accepted that there is a high prevalence of depression among people with diabetes [36]. In this sample, mean CES-D score was 13.0, range (0–42), which represents the results obtained for the whole analysed population [20] and this result was higher than in the Harrington et al. 2021 study (8.7) – in our study group there were more people reporting high depressive symptoms [37]. Based on a value of

10, which is the optimal cut-off point for screening depression diagnosis on the PHQ-9 scale in our study 25.9% of people have depression compared to the Egbuonu et al in 2021 where the proportion was 33.3% [38].

Gender did not play a significant role in differentiating between frequency of occurrence of eating disorders and depression in our study, despite the fact that these were women who had higher test scores. Other studies confirm that these problems more frequently by women than men [34,39,40].

In the further part of the study, we showed a relationship between eating disorders and depression. Depression and ED were commonly but not universally associated. This may indicate either a shared vulnerability to eating and mood problems, or that existing difficulties in one realm can confer risk in the other [14].

In the following, we took a pioneering approach. We analyzed the comorbidity of eating disorder symptoms (EAT-26 subscales) with depression and socio-demographic characteristics.

The “Dieting” factor may indicate a tendency to a too restrictive diet – on the one hand, it may help to control diabetes, on the other hand, excessive control in this aspect may intensify symptoms of depression, as it is associated with frustration, reduced quality of life, and may also be an indicator of the risk of anorexia. Coexisting type 1 diabetes and anorexia nervosa (AN) (one of the primary diagnoses of ED) cause five times more deaths than AN alone due to complications of diabetes, which are exacerbated by incorrect or missed insulin doses [41,42]. We observed a trend for the correlation with the “Dieting” factor and age. The study by Giannunzio et al. 2018 provides evidence of dysfunctional decision making in adult patients with AN and reveals an association between poor decision making and excessive punishment sensitivity in AN [43]. In the context of diabetes, the punishments that patients fear may be poor glycemic control or excessive body weight expressed in the BMI index.

“Bulimia and Food Preoccupation” factor shows the complicated relationship between obsessive thinking and the form of relieving tension by eating and then vomiting. The coexistence of diabetes with bulimia and depression can lead to the state of so-called “brittle di-

abetes”, a state in which patients are at risk for many unfortunate consequences: poor glycemic control with its complications, more emergency room and hospital admissions, strains on relationships, and greater healthcare utilization and diabetes distress [44]. Treating these patients can be difficult, challenging and requiring a high involvement of the therapeutic team and a holistic approach. Psychotherapy and pharmacotherapy alone may not be sufficient treatment; it is very important to combine them. However, the inclusion of pharmacotherapy may carry the risk of side effects causing a vicious circle effect: treatment may not work due to vomiting, which may cause stronger tension, causing further episodes of binge eating and vomiting, and this secondarily intensifies clumsiness, inability to get out of the situation and deepens depressed state. In the statistical analysis, we found a trend for the correlation between this bulimic factor and the BMI index, which further illustrates the problem described above.

“Oral control” factor associated with excessive control of eating, both in the context of anorexia and obsessive behavior. Guilt for what you ate can manifest itself in a diabetic patient, e.g. a patient eats something because he had low blood sugar and then feels guilty and as a result his mood decreases and becomes more depressive, or another situation when the patient deliberately lowers the dose of insulin to eat less and is hypoinsulinized over time. Guilt for what you ate can manifest itself in a diabetic patient, e.g. a patient eats something because he had low blood sugar and then feels guilty and as a result his mood decreases and becomes more depressive, or another situation when the patient deliberately lowers the dose of insulin to eat less and is hypoinsulinized over time [45]. And it was for this factor that a significant correlation with the Depression Scale (CES-D) was found.

The preliminary assessment of the above analyzes indicates the complexity of the problem of eating disorders, depression and type 1 diabetes, which may indicate difficulties in the treatment of such patients. In addition, the lack of more research in the literature on this complex problem among adults may suggest the desirability of conducting such pre-screening tests.

The complexity of the problem also shows how important it seems to build specialized

therapeutic teams, including doctors, nurses, psychologists and dietitians for coordinated and better patient care.

The role of a dietician in the treatment of this complex combination of diabetes and psychological disorders is very important at every stage of work with the patient: whether it is a period of newly diagnosed diabetes, or re-education of a person with a long-term disease, or recognition of psychological disorders in diabetes, or diagnosing diabetes in with psychological problems. At each of these stages, the dietitian should cooperate with the therapeutic team to get to know the patient better and choose the appropriate method of education – making the patient friends with diabetes. It seems very important here to implement an individual approach, looking for specific solutions for a specific patient. In addition, a dietitian may be the first person who can notice new, “strange” behaviors, especially those related to the patient’s diet and eating, and draw the attention of the therapeutic team to a new problem.

Quoting Treasure et al. 2011 [46] “...the nutritional and psychological elements of care can be thought of as being connected by a rubber band, moving in tandem and relative to each other during treatment”. If the nutritional progress outpaces the psychological progress (as is often the case in inpatient treatment), the rubber band is at risk of breaking, and nutritional progress may not be sustained. Likewise, if psychological progress outpaces nutritional progress, psychological progress may not be sustained due to the persistent effects of starvation [46,47].

Dietitians because of their clinical knowledge and skills of nutrition education and counselling seem to be an ideal professionals to address the nutritional aspects of care to complement psychological evidence-based treatment and on recent standards of medical care in diabetes [47].

The limitations of our study are the fact that it was one-center study, we had small group and no control group, and the patients had a similar model of T1DM treatment. For this reason, we may not have achieved statistical power in the above correlations.

CONCLUSION

People with type 1 diabetes, due to the increased risk of eating disorders or depression, require comprehensive care of a therapeutic team, which should include a diabetologist, psychologist, psychiatrist, diabetes educator, nurse, nutritionist.

More specific information about nutritional management and dietician contribution to interdisciplinary team needs implementing in the paper based on recent standards of medical care in diabetes.

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