

SCREENING FOR EATING DISORDERS IN PATIENTS WITH DIABETES IN A PUBLIC HEALTHCARE SERVICE

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Highlights: (1) The association between eating disorders and depression indicates the need for integrated care. (2) Elevated BMI and depression are associated with a higher risk of eating disorders. (3) The findings reinforce the importance of early screening and multidisciplinary interventions in type 1 diabetes.

PRE-PROOF

(as accepted)

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ABSTRACT

Objective: To investigate the prevalence of eating disorders in patients with type 1 diabetes mellitus and the correlation with depression, anxiety, and stress. Method: Cross-sectional observational study. The sample consisted of 111 patients with type 1 diabetes mellitus, assessed using structured questionnaires, including the Eating and Weight Patterns Questionnaire-5, the Sick Control One Stone Fat Food questionnaire, and the Depression, Anxiety, and Stress Scale. Variables were analyzed using descriptive statistics. Associations between categorical variables were tested using the chi-square test (including Monte Carlo simulation when necessary), and quantitative variables were analyzed using Student's t-test. Variables with $p < 0.20$ in the univariate analysis were included in a multivariate logistic regression model using the backward method, with $p < 0.05$ considered statistically significant. Results: The results revealed that 37.8% of participants presented eating disorders according to the Sick Control One Stone Fat Food test, whereas the Eating and Weight Patterns Questionnaire-5 identified a prevalence of 2.7%. In addition, a significant association was observed between the presence of eating disorders and elevated body mass index, as well as between eating disorders and depression. The analysis of mental health symptoms showed prevalences of 22.5% for depression, 21.6% for anxiety, and 13.5% for stress among the patients. Conclusion: The findings indicate that patients with type 1 diabetes mellitus are at increased risk for eating disorders, particularly when associated with higher body mass index and symptoms of depression. These results reinforce the need for early screening strategies and integrated follow-up care that includes mental health.

Keywords: Type 1 Diabetes Mellitus; Anorexia Nervosa; Bulimia Nervosa; Binge Eating Disorder.

INTRODUCTION

Diabetes Mellitus (DM) is a global problem that affects the lives of 500 million people¹. Several studies indicate that, in addition to glucose variability, variability in other risk factors such as blood pressure, plasma lipids, heart rate, body weight, and serum uric acid may contribute to the development of DM complications. Furthermore, the simultaneous presence of variability in these risk factors may result in additive deleterious

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effects². The global prevalence of type 1 diabetes (T1DM) varies worldwide. A meta-analysis revealed an incidence of 15 cases per 100,000 people and a prevalence of 9.5% worldwide, with a significant increase in both incidence and prevalence over time³. Patients with T1DM have mortality rates that are 3 to 18 times higher than expected in their respective countries. Premature mortality in patients with type 1 DM is predominantly caused by acute and chronic complications of the disease. Cardiovascular diseases are the leading cause, accounting for two-thirds of deaths⁴. Excessive and persistent risks of myocardial infarction, heart failure, and stroke indicate the need for secondary prevention strategies⁵.

There is a significant and clear connection between eating disorders (EDs) and T1DM, as demonstrated in a meta-analysis⁶. The main EDs found in patients diagnosed with T1DM are bulimia nervosa (BN) and binge eating disorder (BED)⁶, although cases of anorexia nervosa (AN) may also occur⁷. The etiology of EDs involves biological, genetic, psychological, familial, and sociocultural factors. These are serious conditions that significantly impact morbidity, quality of life, and mortality among those affected, representing a public health problem. These disorders are known for their high mortality rates, especially due to cardiac complications and suicide⁸.

In the general population, the combined lifetime and 12-month prevalence of EDs was 0.91% and 0.43%, respectively. When all types of EDs are considered, prevalence values increase to 1.69% over the lifetime and 0.72% over 12 months. The specific lifetime prevalence for AN, BN, and BED was 0.16%, 0.63%, and 1.53%, respectively. These values vary between men and women, with women being more affected (0.74% and 2.58%, respectively)⁹.

EDs are more common in individuals with T1DM. The combined prevalence of EDs in this population is 24%¹⁰. When the Diabetes Eating Problem Survey–Revised (DEPS-R) questionnaire was used, the values reached 27%. The prevalence of ED symptoms is 70% higher in women than in men with T1DM¹⁰. Among preadolescents, the prevalence is 1%, whereas among adolescents it ranges from 30% to 39%. When considering sex, the prevalence is 15.9% in men and 37.9% in women. Specifically, binge eating disorder (BED) affects 29.7% of patients with T1DM, anorexia nervosa (AN)

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affects up to 17%, and bulimia nervosa (BN) has a prevalence ranging from 1.4% to 35% in this population¹¹.

Psychiatric disorders may also be related to T1DM. A systematic review study found a high prevalence of symptoms of depression and anxiety among young individuals with T1DM, which may potentially compromise diabetes management and glycemic control¹². Another meta-analysis found a high prevalence of depression in individuals with T1DM and T2DM¹³.

The comprehensive approach proposed for individuals with EDs includes the use of screening tools for early diagnosis, which are essential for better treatment outcomes. After screening and a possible diagnosis, the appropriate healthcare setting should be defined based on the patient's nutritional status. These individuals should be assessed and treated by a multidisciplinary team, which will establish individualized therapeutic goals. Early nutritional intervention is crucial to normalize eating patterns and prevent the chronicity of these disorders⁸.

In the literature, several validated instruments are available to screen for EDs in the general population. In addition, structured interviews are available to assess ED symptoms in specific individuals, such as the Questionnaire of Eating and Weight Patterns-5 (QEWP-5), the Sick Control One Stone Fat Food (SCOFF), as well as other self-report questionnaires used to evaluate characteristics commonly associated with EDs¹⁴. For the specific screening of EDs in individuals with T1DM, the Diabetes Eating Problem Survey–Revised (DEPS-R) questionnaire is available; however, this instrument has not been validated for Brazilian Portuguese¹⁵.

Recent-onset T1DM in adults is associated with a significantly higher risk of mental disorders compared with the general population without DM. One study showed that, even after adjustments for factors such as age, sex, BMI, socioeconomic status, alcohol consumption, physical activity, and comorbidities, these individuals are more likely to develop mental disorders, including depression, mood disorders, anxiety, and stress¹⁶. These findings reinforce the need for psychological screening in this population.

Several validated questionnaires are described in the literature for screening mental disorders. The Depression, Anxiety, and Stress Scale (DASS-21) was selected due

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to its good sensitivity and specificity, in addition to covering a broad range of conditions¹⁷.

Considering the potential impact of EDs on metabolic control, the risk of complications, and the quality of life of individuals with T1DM, as well as the scarcity of national studies that evaluate EDs and mental health in an integrated manner in this population, this study aimed to investigate the prevalence of EDs and their association with symptoms of depression, anxiety, and stress in patients with T1DM.

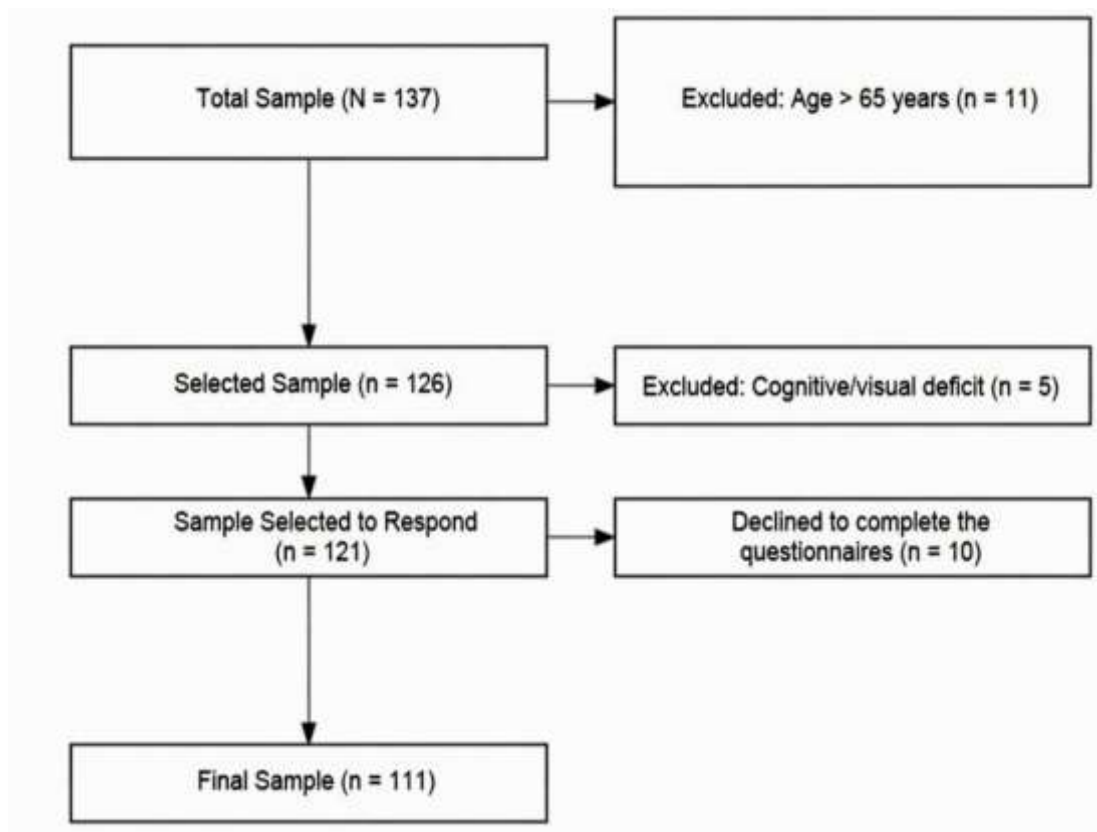
METHOD

This was a cross-sectional observational study conducted in 2024 at Santa Casa de Misericórdia Hospital in Belo Horizonte, Minas Gerais, Brazil (SCBH). The inclusion criteria were patients of any sex with a diagnosis of T1DM, aged between 13 and 65 years. The exclusion criteria were illiterate patients, visually impaired individuals with significant impairments and disabilities, and/or patients who refused to complete the instruments, even with assistance from third parties.

The sample size calculation was performed using G*Power software version 3.1.9.7, considering 80% power, a 95% confidence interval, and an ED prevalence in T1DM of 20.3%, based on the article by Wisting et al. (2018)¹⁸. The minimum required sample size was 105 participants.

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Figure 1: Flowchart of participant selection for the study



Source: Prepared by the authors (2024).

To assess EDs, the Sick Control One Stone Fat Food (SCOFF)¹⁹ and Questionnaire on Eating and Weight Patterns-5 (QEWP-5)²⁰ instruments were used. To assess levels of depression, anxiety, and stress, the Depression, Anxiety, and Stress Scale (DASS-21)¹⁷ was used.

Data were collected using structured questionnaires made available through Google Forms. The questionnaires were developed to collect sociodemographic and clinical information, in addition to the study instruments themselves. All participants received a tablet to complete the survey. To ensure standardization, detailed completion instructions were provided at the beginning of the form. The sociodemographic questionnaire items are available in Supplementary Material 1, along with the questionnaires used.

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The dependent variable studied was the presence of EDs. The independent variables were sex, age, ethnicity, marital status, education level, monthly household income, number of individuals financially dependent on the household income, BMI, physical activity practice, alcohol consumption, smoking, drug use, diabetes-related complications, age at diabetes diagnosis, duration of diabetes diagnosis, value of the most recent glycated hemoglobin, diabetes treatment, presence of EDs among first-degree relatives, deliberate restriction of insulin use to avoid weight gain, in addition to symptoms of depression, anxiety, and stress.

Exploratory statistical techniques were used for data analysis to allow better visualization of the general characteristics of the data.

Data were presented in frequency tables with absolute frequencies and their respective percentages, as well as descriptive statistics (mean, median, standard deviation, minimum and maximum values) for quantitative data.

Categorical variables were assessed using the chi-square test and chi-square test with Monte Carlo simulation. Student's t-test was used for age comparison.

Subsequently, a multivariate logistic regression model was performed to determine which factors were associated with Bethesda I classification. At this stage, all variables with a p-value < 0.20 in the univariate analysis were selected for inclusion in the initial multivariate logistic regression model. The backward method was used; that is, the analysis started with the full model, with successive exclusion of variables that, after adjustment in relation to the others, did not present a significance level of $p < 0.05$. Variables that showed statistical significance ($p < 0.05$) and a significant Odds Ratio (OR) according to the 95% confidence interval remained in the final multivariate logistic regression model. Variables with more than two categories were transformed into dummy variables. Variables showing collinearity were evaluated, and those considered most representative for explaining the Bethesda I outcome remained in the model. The likelihood ratio test was used to define the final model.

The study was approved by the Research Ethics Committee (Certificate of Presentation for Ethical Consideration No. 73416923.4.0000.5138). All participants were informed about the potential risks and benefits of participating in the study and signed the informed consent form before completing the online questionnaires. If the participant was

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younger than 18 years of age, the specific informed consent form and the informed assent form were signed by the parents or legal guardians, in accordance with Resolution 466/12 of the Brazilian National Health Council.

RESULTS

A total of 111 individuals with T1DM participated in the study. Three (2.7%) cases of BED or BN were identified using the QEWP-5 questionnaire, and 42 (37.8%) positive cases for AN and BN were identified using the SCOFF test. All individuals identified as positive by the QEWP-5 were also positive by the SCOFF; therefore, the prevalence of EDs in the sample was 37.8%.

Regarding the sociodemographic data, sex, age, race, marital status, monthly household income, and the number of individuals dependent on that income were evaluated. There was a predominance of women (62.2%), with a mean age of 37 years (SD = 14.8), ranging from 13 to 64 years. The age distribution was balanced, with 11.7% in the 13–18 years age group, 42.2% between 19 and 40 years, and 45.0% above 41 years. Most participants identified as mixed-race (44.1%) or White (29.7%), while 24.3% identified as Black. Regarding marital status, 52.3% were single, 38.7% were married, and 10.0% were divorced, separated, or widowed. In terms of education, 37.8% had completed high school, and 18.0% had completed higher education. Monthly household income was predominantly between 1 and 3 minimum wages (50.5%), and the mean number of individuals dependent on household income was 3, with most participants (58.2%) having 2 to 3 dependents.

The mean BMI was 25.22 kg/m², ranging from 16.59 to 46.59 kg/m². Among the participants, 61 (55.0%) had normal weight, 35 (31.5%) were overweight, and 15 (13.5%) were obese. Regarding physical activity practice, 56 (50.5%) reported engaging in at least 150 minutes per week. In addition, alcohol consumption was reported by 83 (74.8%) participants, whereas 6 (5.4%) were smokers and 2 (1.8%) reported drug use.

Regarding diabetes-related complications, 30 (27.0%) participants reported having at least one complication, with diabetic retinopathy being the most common, affecting 22.5% of cases. The most frequently reported comorbidities included thyroid

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disease, present in 22 (19.2%) participants, and rheumatologic diseases, present in 12 (10.8%).

To better understand the clinical history of the participants, the mean age at T1DM diagnosis was also evaluated, which was 20 years, ranging from 2 to 62 years; the mean duration of diagnosis was 17.33 years, ranging from 1 to 45 years; and the mean value of the most recent glycosylated hemoglobin was 8.08%, with values ranging from 4.8% to 17.0%.

In addition, 45 (40.5%) participants reported having first-degree relatives with diabetes. Regarding diabetes treatment, 98 (88.3%) used multiple daily insulin injections (using pens or syringes), and 13 (11.7%) used an insulin pump. Nine participants (8.1%) reported deliberate restriction of insulin use to avoid weight gain.

In this study, sociodemographic factors that could be associated with the presence of eating disorders according to the SCOFF questionnaire were also analyzed. Regarding sex, there was a predominance of female participants in the sample, and no statistically significant association with EDs was identified ($p = 0.455$).

The mean age of individuals without eating disorders was 37.6 years ($SD = 14.7$), whereas the mean age of individuals with eating disorders was 36 years ($SD = 15.2$), with no significant difference. When age group was considered, 8.7% of individuals without EDs were aged up to 18 years, compared with 16.7% of individuals with eating disorders. In the 19 to 40 years age group, the percentages were 46.6% and 38.1% for the groups without and with eating disorders, respectively. Among participants older than 40 years, 44.9% of individuals without eating disorders and 45.2% of individuals with eating disorders were observed. The difference between groups was not statistically significant ($p = 0.384$).

Regarding education level, 17.4% of individuals without EDs had incomplete elementary education, compared with 23.8% among those with eating disorders. For completed high school education, the percentages were 46.4% and 45.2%, respectively. For completed higher education, the values were 36.2% and 31.0%. The observed difference was also not significant ($p = 0.683$).

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The analysis of marital status showed a significant association with EDs ($p = 0.022$), with married participants presenting a higher percentage of EDs compared with participants without EDs, whereas among the other categories, such as single individuals, the proportion was similar. None of the participants with EDs were divorced, compared with 14.5% of those without eating disorders.

Although income did not reach statistical significance, patients with eating disorders tended to be concentrated in lower-income categories (71.4% earned up to 2 minimum wages).

Table 1 presents a univariate association analysis of the clinical variables and lifestyle habits of patients with diabetes in relation to EDs assessed using the SCOFF questionnaire.

The mean BMI was significantly higher among individuals with EDs (27.5; SD = 5.6) compared with those without eating disorders (23.9; SD = 4.7), with a p -value < 0.001.

Regular physical activity was reported by 49.3% of individuals without EDs and 50.0% of individuals with eating disorders, with no statistically significant difference ($p = 1.000$).

Alcohol consumption was reported by 29.0% of individuals without eating disorders and by 19.0% of those with eating disorders, with no significant difference ($p = 0.242$). Similarly, smoking behavior was comparable between the groups (5.8% versus 4.8%, $p = 1.000$). Drug use was reported only among individuals with EDs (4.8%, $p = 0.141$).

Regarding diabetes treatment, 13.0% of individuals without EDs and 9.5% of those with eating disorders used an insulin pump, whereas 87.0% and 90.5%, respectively, used multiple daily insulin injections, with no significant differences ($p = 0.763$).

The mean age at diabetes diagnosis was 19.6 years (SD = 11.9) among individuals without eating disorders and 20.9 years (SD = 13.3) among those with eating disorders ($p = 0.585$). The duration of diabetes was shorter among individuals with EDs (15.4 years; SD = 9.7) compared with those without eating disorders (18.5 years; SD = 9.5), but this difference did not reach statistical significance ($p = 0.098$). The mean most recent

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glycated hemoglobin (A1c) was similar between the groups (8.0; SD = 1.4 versus 8.2; SD = 1.9, $p = 0.643$).

The presence of diabetes complications was reported by 27.5% of individuals without EDs and 26.2% of those with eating disorders, with no significant difference ($p = 0.877$). Specific complications, such as diabetic retinopathy (23.2% versus 21.4%, $p = 0.830$), nephropathy (10.1% versus 2.4%, $p = 0.154$), neuropathy (7.2% versus 14.3%, $p = 0.327$), and cardiovascular disease (7.2% versus 7.1%, $p = 1.000$), also showed no significant differences between the groups.

The presence of EDs among first-degree relatives was reported by 4.3% of individuals without EDs and 11.9% of those with eating disorders, without statistical significance ($p = 0.152$). Deliberate restriction of insulin use to avoid weight gain was more frequent among individuals with EDs (11.9%) compared with those without eating disorders (5.8%), but this difference was not statistically significant ($p = 0.295$).

The prevalence of conditions such as thyroid disorders was significantly lower among individuals with EDs (9.5%) compared with those without eating disorders (26.1%), with a p -value of 0.034. Rheumatologic diseases (8.7% versus 14.3%, $p = 0.365$) and heart diseases (2.9% versus 7.1%, $p = 0.365$) did not differ significantly between the groups.

These results suggest that factors such as elevated BMI may be associated with the presence of EDs among individuals with diabetes, whereas other sociodemographic and health-related variables did not show significant differences. Table 1 describes the clinical variables and lifestyle habits of the patients assessed using the SCOFF instrument.

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Table 1. Analysis of clinical variables and lifestyle habits of patients with diabetes in relation to eating disorders assessed by the SCOFF questionnaire

Variables	Eating Disorders by SCOFF No (n = 69)	Eating Disorders by SCOFF Yes (n = 42)	<i>p</i> - value
Regular physical activity	34 (49.3%)	21 (50.0%)	1.000
BMI (mean [SD])	23.9 (4.7)	27.5 (5.6)	<0.001
Alcohol consumption	20 (29.0%)	8 (19.0%)	0.242
Cigarette smoking	4 (5.8%)	2 (4.8%)	1.000
Drug use	0 (0.0%)	2 (4.8%)	0.141
Diabetes treatment			
Insulin pump	9 (13.0%)	4 (9.5%)	0.763
Multiple daily insulin injections	60 (87.0%)	38 (90.5%)	
Age at diabetes diagnosis, years (mean [SD])	19.6 (11.9)	20.9 (13.3)	0.585 ^t
Duration of diabetes, years (mean [SD])	18.5 (9.5)	15.4 (9.7)	0.098 ^t
Most recent glycated hemoglobin (A1c), % (mean [SD])	8.0 (1.4)	8.2 (1.9)	0.643 ^t
Any diabetes-related complication	19 (27.5%)	11 (26.2%)	0.877
Type of complication			
Diabetic retinopathy	16 (23.2%)	9 (21.4%)	0.830
Nephropathy	7 (10.1%)	1 (2.4%)	0.154
Neuropathy	5 (7.2%)	6 (14.3%)	0.327
Cardiovascular disease	5 (7.2%)	3 (7.1%)	1.000
First-degree relatives (father, mother, siblings, children) with eating disorders	3 (4.3%)	5 (11.9%)	0.152
Deliberate insulin restriction to avoid weight gain	4 (5.8%)	5 (11.9%)	0.295
Comorbid conditions			
Thyroid disease	18 (26.1%)	4 (9.5%)	0.034
Rheumatologic diseases	6 (8.7%)	6 (14.3%)	0.365
Heart disease	2 (2.9%)	3 (7.1%)	0.365

Legend: q = chi-square test; f = Fisher's exact test; ^t Student's t-test.

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This study also aimed to evaluate the association between symptoms of anxiety, depression, and stress, as measured by the DASS-21 questionnaire, and the presence of EDs in patients with DM.

Regarding psychiatric disorders associated with T1DM, 22.5% of participants tested positive for depression according to the DASS-21 questionnaire, including 12 (10.8%) mild cases, 10 (9.0%) moderate cases, and 3 (2.7%) severe cases. The DASS-21 questionnaire also enabled screening for anxiety, totaling 21.6%, with 8 (7.2%) classified as mild cases, 12 (10.8%) as moderate cases, and 4 (3.6%) as severe cases. Regarding stress, also detected by the DASS-21, 13.5% of the sample tested positive, including 12 (10.8%) mild cases and 3 (2.7%) moderate cases.

In the association analysis, a statistically significant relationship was found between EDs and depressive symptoms ($p = 0.019$). Individuals with EDs showed a significantly higher prevalence of depressive symptoms (33.3%) compared with those without EDs (15.9%).

The association between EDs and anxiety symptoms did not reach statistical significance ($p = 0.062$). However, there was a trend indicating a higher prevalence of anxiety among individuals with EDs (31.0%) compared with those without EDs (15.9%).

Regarding stress symptoms, no significant association was found ($p = 0.862$). The prevalence of stress was similar between the two groups, with 14.3% of individuals with EDs and 13.0% of those without EDs reporting stress symptoms.

To explore the factors associated with the presence of EDs, a multiple regression analysis was performed, the results of which are presented in Table 2.

It was observed that BMI and depression were significantly associated with the presence of EDs. Individuals who were overweight or obese, as well as those with depression, were more likely to present EDs ($p < 0.001$).

Overweight patients had 5.02 times higher odds of presenting EDs compared with patients with normal weight (95% CI = 1.90–13.25). Patients with obesity had 9.90 times higher odds of presenting EDs compared with patients with normal weight (95% CI = 2.59–37.87).

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Regarding depression as assessed by the DASS-21, patients with depression had 3.39 times higher odds of presenting EDs compared with patients without depression (95% CI = 1.18–9.74).

Table 2. Initial and final multiple logistic regression models for the outcome Eating Disorder

Initial Model

Variables	OR	95% CI for OR (Lower)	95% CI for OR (Upper)	p-value
Marital status				0.885
Married	1.000	–	–	–
Divorced/Separated/Widowed	0.000	0.000	–	0.999
Single	1.274	0.489	3.318	0.620
Income				0.403
Up to 2 minimum wages	1.000	–	–	–
Between 2 and 3 minimum wages	0.464	0.122	1.762	0.260
More than 3 minimum wages	0.568	0.184	1.758	0.326
BMI classification				0.001
Normal weight	1.000	–	–	–
Overweight	4.677	1.616	13.530	0.004
Obese	10.333	2.345	45.534	0.002
Depression	0.399	0.131	1.219	0.107
Thyroid disease	0.347	0.085	1.420	0.141
Constant	0.768	–	–	0.646

Final Model

Variables	OR	95% CI for OR (Lower)	95% CI for OR (Upper)	p-value
BMI classification				<0.001
Normal weight	1.000	–	–	–
Overweight	5.021	1.903	13.249	<0.001
Obese	9.899	2.588	37.865	<0.001
Depression	3.385	1.177	9.738	0.024
Constant	0.186	–	–	<0.001

Legend: OR = odds ratio; minimum wages = Brazilian minimum wages; Hosmer–Lemeshow test: $p = 0.495$; pseudo- $R^2 = 0.567$.

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DISCUSSION

The present study evaluated the prevalence of EDs, AN, BN, and BED, as well as the prevalence of depression, stress, and anxiety, using instruments validated in the scientific literature, in individuals diagnosed with T1DM. Although the DEPS-R is the most widely used instrument to assess the prevalence of EDs in this population¹⁰, we chose not to use it because, despite having been translated and adapted into Brazilian Portuguese, the psychometric properties of the instrument have not been assessed; therefore, it has not yet been fully validated for Brazilian Portuguese. This important limitation in the process of assessing the psychometric properties of the instrument compromised its applicability in this study¹⁵. However, all questionnaires used in this study were translated, adapted, and tested in the Brazilian population, demonstrating good psychometric properties^{19,20,17}.

The association between EDs and T1DM is well described in the literature through recent systematic reviews with meta-analyses^{6,10}. The literature suggests that EDs may be twice as common in people living with a diagnosis of T1DM²¹. The pooled prevalence of EDs in these studies and in this population, based on various screening instruments, was 24%¹⁰, and the association between EDs and T1DM was positive regardless of the screening instrument used⁶. These values are lower, but consistent with the results presented in the present study, which demonstrated a prevalence of 37.8% for EDs when the SCOFF test was applied.

When compared only with studies that applied the SCOFF in the T1DM population, prevalence ranged from 10.8%, 21.7%, 28.2%, and 30.2%²², demonstrating that the population evaluated in the present study showed a higher prevalence of disorders detected by the SCOFF instrument. The SCOFF test is a highly sensitive screening tool, particularly for young women at risk of AN and BN²³, and is highly recommended for screening purposes²⁴.

All three individuals identified by the QEWP-5 had positive SCOFF results, of whom two were identified with BN and one with BED. The difference observed in the prevalences identified by the QEWP-5 and SCOFF instruments raises questions regarding the sensitivity and specificity of each tool in identifying EDs in T1DM populations. The QEWP-5 may be more specific, identifying clearer cases of BED and BN, whereas the

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SCOFF may be more sensitive, capturing a broader range of symptoms related to EDs in general without specifying them^{24,25}.

These findings highlight the importance of using multiple screening tools to detect EDs in patients with T1DM. The implementation of screening protocols using multiple instruments may improve the early detection and clinical management of these disorders, potentially leading to better health outcomes²⁶.

The low prevalence of BED and BN identified by the QEWP-5, contrasted with the high prevalence of symptoms suggestive of EDs identified by the SCOFF, suggests the need for broader and more multifaceted approaches to screening for EDs in patients with T1DM²³.

Although our results did not indicate a significant difference between sexes in the diagnosis of EDs using the SCOFF instrument, a higher proportion of positive results was observed among women (66.7%) compared with men (33.3%). These findings are consistent with the existing literature, which demonstrates a higher prevalence of EDs among women with T1DM (37.9%) than among men (15.9%)¹¹. The DEPS-R instrument also reflects this trend among adolescents, indicating a higher prevalence among females (35%) compared with males (21%)²⁷.

The significant correlation between marital status and EDs identified in the sample demonstrates a higher prevalence of EDs among married individuals (47.6%). Although the literature is scarce regarding the correlation between marital status and EDs, one study demonstrated this association and suggests that marital conflicts play an important role in the development and maintenance of EDs among married women²⁸.

The relationship between thyroid dysfunction and DM is well established in the literature. Multiple studies have demonstrated a high prevalence of thyroid disorders in patients with DM, and vice versa^{2,5,29}, although our findings did not indicate that thyroid conditions may be related to the occurrence of EDs in individuals with T1DM. In addition, in our study, elevated BMI also demonstrated a positive association with EDs. Obesity and EDs, when coexisting, are associated with serious impacts on physical and mental health. Individuals presenting both conditions have an increased risk of developing complications compared with those affected by only one of these conditions

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in isolation³⁰. On the other hand, other sociodemographic and health-related variables did not show significant differences in our analyses.

Data associating T1DM with EDs in the Brazilian population are scarce. A systematic review with meta-analysis of epidemiological studies on EDs in Latin America revealed a pooled prevalence of 0.1% for AN, 1.16% for BN, and 3.53% for BED in the general population older than 10 years³¹. In 2019, the first systematic review with meta-analysis in Brazilian university students demonstrated that the prevalence of EDs according to the EAT-26 test was 16.7%³². It has also been reported that there is an association between compensatory eating behaviors and affective temperament in the Brazilian population, with participants who adopt frequent compensatory eating behaviors being more likely to present dysfunctional affective traits³³.

The prevalence of EDs among the evaluated Brazilian university students differed between sexes. Among women, 7.0% presented BED, 4.4% engaged in purging behaviors, and 13.5% reported dietary restriction. In contrast, among men, 1.8% presented BED, 0.6% engaged in purging behaviors, and 4.9% reported dietary restriction. These behaviors were significantly associated with female sex, smoking, alcohol consumption, body image dissatisfaction, overweight, high levels of perceived stress, and the presence of self-reported depressive symptoms³⁴.

Only one brief report applied the DEPS-R questionnaire in the Brazilian population with individuals with T1DM. In this study, 39.6% of patients were found to be at high risk for disordered eating behaviors, and a DEPS-R score greater than 20 had a negative impact on the metabolic control of these individuals³⁵. We emphasize that, although the DEPS-R has been translated and adapted into Brazilian Portuguese, its psychometric properties have not yet been verified¹⁵.

Mental disorders and T1DM are intrinsically related. A systematic review with meta-analysis demonstrated that, in studies using interviews as the diagnostic method, the prevalence of mental disorders was significantly higher compared with studies using clinical records, with a difference of up to 24-fold. In studies with a control group, the prevalence of nearly all mental disorders was higher in samples of individuals with T1DM³⁶.

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The findings described above highlight the importance of nutritional status and mental health in assessing the risk of EDs. Individuals with overweight, obesity, and depression are significantly more likely to develop EDs, indicating the need for special attention to these groups during prevention and treatment^{6,12,37}.

Individuals with DM may have a higher prevalence of EDs due to concerns about food intake and body weight, which may lead to anxiety, depression, and/or stress³⁷. The diagnosis of T1DM in adults is clearly linked to an increased risk of mental disorders compared with the general population. This increased risk underscores the need to monitor and provide mental health support for patients newly diagnosed with T1DM in order to improve glycemic control and enhance quality of life¹⁶.

The prevalence of depression in individuals with T1DM varies in the literature from 3.53% to 57.58%, values consistent with our findings of 22.5%. Regarding EDs in the T1DM population, prevalence ranges from 0.96% to 33.33%. Our findings, as assessed by the SCOFF, demonstrated higher values, reaching 37.8%. This wide variation in prevalence reported in the literature in both cases is justified by the assessment instrument used³⁶.

In our study, an association between depression and EDs, as assessed by the DASS-21 and SCOFF instruments, was identified, reinforcing recent previous findings in the scientific literature.

In children and adolescents with T1DM, depression and anxiety are highly prevalent conditions and may potentially compromise diabetes management and glycemic control¹¹². The close chronological relationship between T1DM and the onset of depression is noteworthy. The diagnosis of T1DM and its treatment burden occur during a period of increased vulnerability to depression³⁸.

The prevalence of anxiety disorders in individuals with T1DM varies in the scientific literature according to the type of assessment instrument used. In studies using diagnostic interviews, prevalence ranged from 2.13% to 31.71%³⁶, values consistent with the findings of our study, which was 21.6%. Although we did not demonstrate an association reaching the conventional threshold for statistical significance, our findings suggest a trend toward significance between anxiety and EDs, as identified by the DASS-

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21 and SCOFF instruments. In our study, no association was found between EDs and stress.

The final regression model showed that the main factors jointly associated with EDs in individuals with T1DM were elevated BMI and depression. Individuals with overweight had five times higher odds of developing EDs, whereas those with obesity had nearly ten times higher odds compared with individuals with normal weight. In addition, the presence of depression tripled the likelihood of EDs. Other factors, such as marital status, income, and thyroid disease, did not show significant associations. These results emphasize the need for targeted interventions to monitor and treat the mental health and nutritional status of these patients in order to improve health outcomes^{39,40}.

Future studies should prioritize cross-validation of the QEWP-5 and SCOFF instruments, in addition to investigating the factors influencing the variations in the observed prevalence rates. It is also essential to evaluate the psychometric properties of the Brazilian Portuguese version of the DEPS-R questionnaire. If confirmed to be adequate, the instrument may be specifically used in T1DM populations.

Our findings reinforce that early, proactive, and personalized screening is essential. Following screening, referral for evaluation by a specialized psychiatrist is recommended to establish an appropriate diagnosis. Subsequently, comprehensive and interdisciplinary interventions should be implemented, combining strategies aimed at the management of both diabetes mellitus and eating disorders⁶.

CONCLUSIONS

This study revealed a high prevalence of EDs detected by the SCOFF test. Overweight, obesity, and depression were associated with a higher risk of developing EDs.

These results emphasize the need for early screening and comprehensive interventions that integrate physical and psychological care, addressing not only nutritional control but also the individual's relationship with food, in order to promote better health among people with T1DM.

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