

Presumptive binge eating disorder in type 2 *diabetes mellitus* patients and its effect in metabolic control

Diagnóstico sugestivo de transtorno da compulsão alimentar periódica em portadores de *diabetes mellitus* tipo 2 e seu efeito sobre o controle metabólico

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ABSTRACT

Objective: This study sought to determine the presence of diagnosis suggestive of binge eating disorder in individuals with type 2 *diabetes mellitus*, and to evaluate the influence of such disorder on the metabolic control. **Methods:** sixty-three patients with type 2 *diabetes mellitus* and registered at the Diabetes and Hypertension Program of a Health Unit in the town of Balneário Camboriú, Santa Catarina, Brazil, were evaluated. The diagnosis of binge eating disorder was made by analysis of the Questionnaire on Eating and Weight Patterns – Revised. For the evaluation of metabolic control, 10 ml of blood was collected, and the serum glucose, glycated hemoglobin, triglycerides, cholesterol and fractions were determined. Weight and height were determined for evaluation of nutritional state, according to the body mass index. **Results:** Among the evaluated individuals, 29% presented a diagnosis suggestive of binge eating disorder, with higher prevalence among females. The individuals with diagnosis suggestive of binge eating disorder presented a higher average body mass index value than the group without diagnosis. The serum concentrations of glycated hemoglobin ($p = 0.02$) and triglycerides ($p = 0.03$) were statistically higher in the group with diagnosis suggestive of binge eating disorder. **Conclusions:** Based on the results of this study, it is possible to conclude that the presence of binge eating disorder in individuals with type 2 *diabetes mellitus* favors an increase in body weight and has a negative influence on metabolic control, contributing to the early emergence of complications related to the disease.

Keywords: Diabetes mellitus, type 2; Eating disorders; Metabolism; Nutritional status; Diabetes complications

RESUMO

Objetivo: O presente estudo objetivou determinar a presença de diagnóstico sugestivo de transtorno da compulsão alimentar

periódica em indivíduos portadores de *Diabetes mellitus* tipo 2 e avaliar a influência deste transtorno sobre o controle metabólico.

Métodos: Foram avaliados 63 pacientes portadores de *diabetes mellitus* tipo 2 cadastrados no Programa de Diabetes e Hipertensão de uma Unidade de Saúde do município de Balneário Camboriú, Santa Catarina. O diagnóstico de transtorno da compulsão alimentar periódica foi realizado por análise do Questionário sobre Padrões de Alimentação e Peso – Revisado. Para avaliação do controle metabólico, foram coletados 10 ml de sangue e determinadas as concentrações séricas de glicose, hemoglobina glicada, triglicerídeos, colesterol e frações. Foram coletados peso e estatura para avaliação do estado nutricional segundo o índice de massa corporal. **Resultados:** Dentre os indivíduos avaliados, 29% apresentaram diagnóstico sugestivo de transtorno da compulsão alimentar periódica, com maior prevalência no sexo feminino. Os indivíduos com diagnóstico sugestivo de transtorno da compulsão alimentar periódica apresentaram valor médio de índice de massa corporal maior que o grupo sem esse diagnóstico. As concentrações séricas de hemoglobina glicada ($p = 0,02$) e triglicerídeos ($p = 0,03$) foram estatisticamente mais elevadas no grupo com diagnóstico sugestivo de transtorno da compulsão alimentar periódica. **Conclusões:** A partir dos resultados do presente estudo, conclui-se que a presença de transtorno da compulsão alimentar periódica em indivíduos portadores de *Diabetes mellitus* tipo 2 favorece a elevação do peso corporal e influencia de forma negativa o controle metabólico, contribuindo para o surgimento precoce de complicações relacionadas à doença.

Descritores: *Diabetes mellitus* tipo 2; Transtornos da alimentação; Metabolismo; Estado nutricional; Complicações do diabetes

INTRODUCTION

Diabetes mellitus (DM) is a multiple etiology syndrome characterized by chronic hyperglycemia and often

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accompanied by dyslipidemia, hypertension and endothelial dysfunction⁽¹⁾.

DM in Brazil and worldwide is considered as a serious public health problem due to the growing number of people affected and to the complexity of dealing with this disease⁽²⁾.

Type 2 DM often occurs in individuals with existing obesity, an additional risk factor that contributes to metabolic changes proper to the disease itself. It is estimated that about 80 to 90% of the individuals affected by the disease present overweight and are obese, and the risk for diabetes is directly associated with increased body mass index (BMI)⁽³⁾.

The relation between DM and psychiatric disorders has been recently described⁽⁴⁻⁵⁾. The concomitance of psychiatric disorders and diabetes may result in unsatisfactory metabolic control, thus increasing morbidity and mortality rates due to the disease⁽⁶⁾.

The treatment of diabetes involves compliance with a diet plan, physical activity and, in most cases, use of medications⁽⁷⁾. Regarding the diet plan, it should be emphasized that, due to the need for restricting food intake, diabetic patients present a risk of developing some type of eating disorder, such as bulimia, anorexia and binge eating disorder (BED)⁽⁴⁾.

Binge eating refers to excessive eating episodes characterized by the consumption of large amounts of food in short time intervals, followed by a feeling of loss of control of what one is eating⁽⁸⁾.

To characterize BED, the binge eating episodes must be recurrent, having occurred at least two days per week in the last six months, associated with absence of inadequate compensating behaviors to avoid weight gain, like those observed in bulimia nervosa⁽⁹⁾. During the binge eating episodes, there is a feeling of lack of control on the behavior associated with intake of large amounts of food, even if the individual is not hungry, leading to major discomfort. This episode is followed by an intense subjective discomfort characterized by feelings of anguish, sadness, guilt, shame and/or self-repulsion⁽⁹⁾.

OBJETIVE

The present study aims at assessing the influence that an eating disorder may exert in the metabolic control of individuals with type 2 DM.

METHODS

Population

Type 2 DM patients from the Diabetes and Hypertension Program of a Public Health Unit in the city of Balneário

Camboriú, Santa Catarina, Brazil, were included in the study.

Sample

Sixty-three patients with type 2 DM constituted the sample. This number of participants was determined by simple random sampling and a 59% prevalence of BED was assumed in diabetics patients as reported in the literature⁽¹⁰⁾ yielding $p=0.1$, at 95% confidence level and 5% sampling error, according to the equation:

$$n = 1,96^2 \times P(1-P)/e^2 = 62,39 \cong 63 \text{ individuals}$$

In which: n = sample; $1,96^2$ = constant value of normal distribution; P = BED prevalence reported in the literature; e = sampling error.

Inclusion criteria

The inclusion criteria were to be registered in the Diabetes and Hypertension Program, to be under diet and/or medication treatment for at least one year. The exclusion criteria were type 1 DM or gestational diabetes.

Consent form

The project was approved by the Ethics Committee of Universidade do Vale do Itajaí, under protocol number 212/08. The patients that accepted to be part of this study signed the informed consent.

Questionnaire application

A self-applied questionnaire was handed to and answered by patients that participated in the study. The Questionnaire on Eating and Weight Patterns – Revised (QEWP-R) was validated by Borges et al.⁽¹¹⁾. The questionnaire was assessed according to established cutoff points, and the diagnosis of BED requires that all items in chart 1 be answered and the absence of non purgative bulimia nervosa as well⁽¹²⁾.

Chart 1. Cut-off points for presumptive BED according to the Questionnaire on Eating and Weight Patterns – Revised (QEWP-R).

| Question | Answer |
|--------------------|--|
| 10 and 11 | 1 (excessive eating episode associated with feeling of loss of control – binge eating) |
| 12 | 3,4 or 5 (at least two days per week, in the last six months) |
| 13 (Letter A to E) | 3 or more items marked yes (at least three associated symptoms) |
| 15 or 16 | 4 or 5 (evident anguish related to binge eating behavior) |

Laboratory tests

A total volume of 10 ml of peripheral blood was drawn from patients after 10 to 12 hour fasting and centrifuged at 3,000 rpm, for 10 minutes. Glucose, glycated hemoglobin, total cholesterol, HDL cholesterol and triglycerides were determined by specific enzymatic kits. LDL cholesterol was calculated according to the Friededwald equation $LDL-c = TC - HDL-c - TGL/5$ ⁽¹³⁾. The reference levels employed by the Brazilian Diabetes Society (Sociedade Brasileira de Diabetes)⁽¹⁾ and the Brazilian Cardiology Society (Sociedade Brasileira de Cardiologia) were adopted⁽¹⁴⁾.

Nutritional status assessment

Weight and height were determined on a Welmy® scale-stadiometer with maximum capacity of 150 kg. Nutritional status was determined by the body mass index (BMI) and classified according to the cutoff points established by the World Health Organization (WHO)⁽¹⁵⁾.

Statistical analysis

The Graph Pad Instat®, version 3.0 package was used. Data are presented as means and standard deviations. Comparisons between the individuals with or without the presumptive diagnosis of BED, for the variables with normal distribution, were performed by means of the two-tailed, non-paired t-test, at a 5% error probability ($p < 0.05$).

RESULTS

Table 1 shows the variables sex and age distributed according to the presence or absence of presumptive diagnosis of BED. Females were predominantly affected with BED. Regarding age, the presumptive diagnosis of BED was higher among patients older than 50 years.

Table 1. Prevalence of presumptive binge eating disorder (BED) distributed per sex and age in type 2 *diabetes mellitus* individuals registered at the Diabetes and Hypertension Program of a Public Healthcare Unit in the city of Balneário Camboriú, SC, Brazil, 2008

| Variables | n | BED Y | | BED N | |
|------------|----|-------|----|-------|----|
| | | n | % | n | % |
| Sex | | | | | |
| Female | 37 | 16 | 43 | 21 | 57 |
| Male | 26 | 2 | 8 | 24 | 92 |
| Age | | | | | |
| ≤ 50 years | 13 | 5 | 38 | 8 | 62 |
| > 50 years | 50 | 13 | 26 | 37 | 74 |

BED Y: presence of BED; BED N: absence of BED.

Means and standard deviations of the BMI related to the presence or absence of BED are presented in table 2. There were no significant differences between the groups; however, there was a strong trend for the group of patients with presumptive diagnosis of BED to have higher BMI than the group without this diagnosis.

Table 2. Means and standard deviations of the body mass index-related of type 2 *diabetes mellitus* individuals with or without presumptive binge eating disorder, registered at the Diabetes and Hypertension Program of a Public Healthcare Unit in the city of Balneário Camboriú, SC, Brazil, 2008

| Group | BMI (Kg/m ²) |
|---------|--------------------------|
| BED Y | 30.10 ± 5.24a |
| BED N | 27.79 ± 4.87a |
| p-value | 0.06 |

BED Y = presence of BED; BED N = absence of BED. Statistical analysis: different letters represent statistically significant differences among groups, with $p < 0.05$.

Regarding the nutritional status data, no malnutrition was observed. The most prevalent nutritional diagnosis in this population was overweight (81%), considering in general the classifications of pre-obesity, obesity class I, class II and class III. By categorizing overweight, there was a higher proportion of patients with pre-obesity (Table 3).

Table 3. Nutritional status (NS) and presence of binge eating disorder (BED) in type 2 *diabetes mellitus* individuals registered at the Diabetes and Hypertension Program of a Public Healthcare Unit in the city of Balneário Camboriú, SC, Brazil, 2008

| NS | BED Y | | BED N | | TOTAL | |
|-------------------|-------|----|-------|----|-------|-----|
| | n | % | n | % | n | % |
| Malnutrition | 0 | 0 | 0 | 0 | 0 | 0 |
| Eutrophy | 2 | 3 | 10 | 16 | 12 | 19 |
| Pre-obesity | 9 | 14 | 26 | 40 | 35 | 56 |
| Obesity class I | 3 | 5 | 7 | 11 | 10 | 16 |
| Obesity class II | 3 | 5 | 1 | 2 | 4 | 6 |
| Obesity class III | 1 | 2 | 1 | 2 | 2 | 3 |
| Total | 18 | 29 | 45 | 71 | 63 | 100 |

BED S: presença de BED; BED N: ausência de BED.

Table 4 displays the means and standard deviations of the serum concentrations of glucose, glycated hemoglobin, cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides of the type 2 diabetes patients with or without the presumptive diagnosis of BED. It was observed that the serum concentrations of glycated hemoglobin and triglycerides were statistically higher in the group with presumptive diagnosis of BED. The patients with presumptive BED showed a strong trend to higher glucose and LDL-cholesterol levels than those with no BED. There was no statistical difference in total cholesterol between groups, although mean cholesterol have been presented higher in patients with

Table 4. Means and standard deviations of the serum concentrations of glucose (mg/dl), glycated hemoglobin (%), cholesterol, HDL-cholesterol (mg/dl), LDL-cholesterol (mg/dl) and triglycerides of the type 2 diabetes patients with or without presumptive binge eating disorder, registered at the Diabetes and Hypertension Program of a Public Healthcare Unit in the city of Balneário Camboriú, SC, Brazil, 2008

| Group | Glucose | Glycated hemoglobin | Total cholesterol | HDL-cholesterol | LDL-cholesterol | Triglycerides |
|---------|-----------------|---------------------|-------------------|-----------------|-----------------|------------------|
| BED Y | 205.31 ± 87.22a | 8.39 ± 1.95a | 205.17 ± 55.25a | 42.57 ± 11.62a | 119.07 ± 34.04a | 199.93 ± 134.63a |
| BED N | 146.25 ± 70.75a | 6.92 ± 0.99b | 184.29 ± 39.94a | 47.89 ± 12.72a | 102.98 ± 32.22a | 137.24 ± 61.69b |
| p-value | 0.06 | 0.002 | 0.14 | 0.31 | 0.08 | 0.03 |

BED Y: presence of BED; BED N: absence of BED. Statistical analysis: different letters represent statistically significant differences among groups, with $p < 0.05$.

presumptive BED. Mean HDL-cholesterol was lower in the BED group than in those without this diagnosis.

DISCUSSION

A high incidence of psychiatric disorders, especially affective and anxiety disorders, including eating disorders, have been recently shown in patients with diabetes^(6,16-18).

The consequences of eating disorders are serious and sometimes may incur in death and, in the case of diabetic patients, they may be the cause of the early appearance of chronic complications associated to diabetes⁽¹⁹⁾.

The occurrence of the presumptive diagnosis of BED in the present study was considered high (29%) and it was predominant among women. Corroborating these findings, Crow et al.⁽¹⁸⁾ assessed 43 type 2 DM patients in Minneapolis, USA, and found a 25.6% prevalence of BED, with a higher proportion among women who had high BMI. A multicenter study in the cities of Essen and Cologne, USA, in 322 type 2 DM patients, showed a larger number of patients with the presumptive diagnosis of BED when compared to the present study (59.4%)⁽¹⁰⁾.

Azevedo et al.⁽⁴⁾ stressed that BED seems to be the most frequent eating disorder found in type 2 DM patients with overweight and obesity. This hypothesis is strengthened in the study of Herpertz et al.⁽¹⁰⁾, in which 341 type 1 DM patients were assessed and the prevalence of BED was 25%, different from 59% found in type 2 DM patients, demonstrating that the occurrence of BED predominates in type 2 DM patients⁽¹⁰⁾.

Regarding BMI, although not statistically different ($p = 0.06$), it was higher in patients with the presumptive diagnosis of BED. Similar results were found in non-type 2 DM obese adolescents, with the BED group having BMI significantly higher than those without BED ($p = 0.03$)⁽²⁰⁾. Passos et al.⁽²¹⁾ remarked that obesity, despite a diagnostic criterion for BED, is a clinical condition that often accompanies this eating disorder.

It is known that obesity is an important risk factor for the appearance of type 2 DM. It has been demonstrated that BED is frequent in obese individuals and it may worsen this finding and greatly increase the risk for

diabetes. A large proportion of overweight was found in the present study. Most overweight patients had pre-obesity and the others, decreasingly, had obesity class I, obesity class II and obesity class III.

It was also observed that the individuals with the presumptive diagnosis of BED had a higher proportion of overweight compared to those without BED.

Although there are young individuals with type 2 DM, it usually occurs after 40 years old. The mean age of the individuals assessed in this study was higher and there was no difference in BED distribution among the age groups (≤ 50 years and > 50 years). Eating disorders were different in diverse age groups in studies involving young type 1 DM patients and adult or elderly type 2 DM patients⁽¹⁰⁾, likewise in the present study.

The presence of eating disorders in DM patients may influence metabolic control, which may be assessed by means of variables such as serum glucose, glycated hemoglobin, cholesterol and their fractions⁽²²⁾.

Poor metabolic control in DM is associated with chronic hyperglycemia, which is the major factor implicated in the late complications of this disease, such as malfunction and failure of several target organs, especially, retinopathy, nephropathy, peripheral neuropathy and vascular diseases^(23,24).

There was a strong trend of higher serum glucose levels in patients with presumptive BED than in those without it. The influence of the eating disorder on blood glucose control was more evident when the glycated hemoglobin was analyzed, being statistically higher in the patients with presumptive BED. In accordance to the present study, Affenito et al.⁽²⁴⁾ also demonstrated high glycated hemoglobin levels in type 1 DM patients with binge eating disorder from Connecticut and Massachusetts, USA. In the studies of Herpertz et al.⁽¹⁰⁾ and Crow et al.⁽¹⁸⁾ assessing type 1 and type 2 DM patients, there was no correlation between the presence of eating disorders and glycated hemoglobin. However, Manucci et al.⁽²²⁾ found a positive correlation of glycated hemoglobin and eating disorder scores, and they emphasize that the presence of an eating disorder is worrisome, for it could hamper drug control of diabetes, requiring the use of more drugs, including insulin, because of high food consumption.

Considering the results of the present study, we highlight the importance of glycated hemoglobin concentrations as an indicator of eating behavior changes because patients' compliance with the long-term eating habits may be inferred; this test also predicts the chronic complications of diabetes⁽¹⁹⁾.

Patients with or without the presumptive diagnosis of BED did not have statistically different levels of total and LDL-cholesterol, although those with BED had mean total cholesterol above the reference levels of the Brazilian Cardiology Society. Mean LDL-cholesterol was higher in BED patients, but in the two groups these values were within the Brazilian Cardiology Society parameters⁽¹⁴⁾. BED may contribute to dyslipidemia in diabetes by increasing the BMI to obesity, which increases insulin resistance, with changes in the action of several enzymes involved in lipid metabolism, changing the plasma concentration of such lipoproteins⁽²⁵⁻²⁶⁾.

Mean HDL-cholesterol was lower in the patients with presumptive BED.

Diabetic patients with presumptive BED had statistically higher triglyceride levels. Vasques et al.⁽²⁷⁾ found that triglycerides and cholesterol levels in diabetic patients with no BED, attending a public healthcare unit, were similar to those of the patients with no BED herein presented, which indicates that the presence of BED may be contributing for the higher concentrations of lipoproteins in these patients.

The high triglyceride levels found in the present study is caused, in part, by excessive fat tissue, especially in the abdominal region; the visceral fat secretes cytokines which interfere in the triglyceride metabolism⁽²⁸⁾. In the present study, the higher triglyceride levels found in the BED patients may be the result of the association between the metabolic changes of obesity and the lack of eating control. In the binge eating disorder, there is an excessive food intake, including high calorie carbohydrate and lipid rich foods, which further increase these lipoproteins⁽²⁹⁾. Diet restriction advised by some health professionals or imposed by the diabetic patients themselves, in which the patients compensate their carbohydrate poor diet with excessive macronutrient eating episodes, encompassing carbohydrates and lipids⁽³⁰⁾.

Eating disorders, including BED, may either unleash diabetes or be triggered by DM⁽³¹⁾.

Azevedo et al.⁽⁴⁾ stressed that, in most cases, BED occurs after the diagnosis of diabetes, which may occur because of increased concern on food intake and restrictive diet plans, as well as due to episodes of hypoglycemia, which may be the cause of hyperphagic behavior associated with the feeling of loss of control over food intake. This hypothesis was supported by the observation that the prevalence of BED in non-diabetics

(1.5 to 5%, maximum of 15%)⁽³²⁻³⁴⁾ is lower than that in diabetic patients (25 to 59%), as found in the present study (29%)^(10,18).

In contrast, the eating disorder may occur before the diagnosis of diabetes, because it increases the individual's predisposition for the onset of disease by inducing overweight and obesity, and impairs glucose metabolism, thus increasing insulin resistance⁽³⁵⁾.

A vicious cycle is established involving obesity, BED and diabetes, making it difficult to identify which factor starts it, either in combination or single-handedly, potentially worsening each other⁽³¹⁾.

Because of the number or risks that they are exposed to, patients must be analyzed by a multidisciplinary team involving physicians, psychologists and dietitians, and the initial investigation of eating disorders in these patients is mandatory, because the episodes of loss of eating control impair the patient's compliance with the treatment aiming at weight reduction, one of the main pillars for the success of metabolic control in type 2 DM⁽³⁶⁾.

CONCLUSION

Based on the results of the present study, it is suggested that the presence of BED contributes for weight increase in type 2 DM patients and, negatively, influences metabolic control, with higher serum glucose, glycated hemoglobin and plasma lipoproteins, especially triglycerides, concentrations. The binge eating disorder, when present in patients with diabetes, either for favoring overweight and obesity or because of the biochemical changes it causes, contributes to the presence of chronic complications, which significantly reduce the patient's quality of life. Considering the complex relation between diabetes and eating disorders, the importance of a multidisciplinary team action is emphasized in order to achieve success in the treatment of diabetic patients and in the improvement in metabolic control.

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