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Brief Research Report

Association between type 2 diabetes and binge eating disorder

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ABSTRACT

INTRODUCTION. Binge eating disorder (BED) was recently recognised as a distinct diagnosis in Denmark. The estimated prevalence of BED in the general population in Denmark is 2-3%. The BED prevalence among patients with type 2 diabetes (T2D) in Denmark remains unknown. This small-scale preliminary cohort study aims to estimate the BED prevalence in obese T2D patients.

METHODS. Patients with T2D and a BMI ≥ 30 kg/m² were recruited from the Steno Diabetes Center Odense outpatient clinic. Patients were screened and categorised into three groups using the Binge Eating Disorder Questionnaire as follows: indication of BED, subthreshold BED symptoms and no BED. Additional clinical data were collected and analysed using group comparison statistics and clinical descriptions.

RESULTS. A total of 84 patients were included; 9.5% of these obese patients with T2D showed indication of BED, while an additional 8.3% showed subthreshold manifestations of BED. Patients with T2D and indication of BED had a significantly lower age, an earlier diabetes onset and a higher BMI than patients with T2D but without BED.

CONCLUSIONS. This study suggested an increased prevalence of BED in obese patients with T2D compared to the general population, suggesting that systematic BED screening may be relevant for this population. Further research is needed to elucidate the association between BED and T2D fully.

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Binge eating disorder (BED) is an eating condition characterised by recurring episodes of consuming large quantities of food over a short period of time, where the person feels a lack of control over their eating and is markedly distressed by their behaviour [1, 2]. Unlike bulimia, BED does not involve compensatory behaviours such as vomiting [3]. BED was recently included in the 11th edition of the International Classification of Diseases (ICD-11) [2]. While the prevalence of BED in Denmark remains unknown, it is estimated that 40,000-50,000 individuals suffer from the condition [4], making BED the most prevalent eating disorder in Denmark [4, 5].

The association between type 2 diabetes (T2D) and obesity is well established, but the association between T2D and BED has only gathered attention more recently. Prevalence estimates of BED in patients with T2D are reported as high as 25.6% [6], falling in the 1.2-25.6% range [7], compared with 2-3% of the background population in Denmark [4] and 2-4% in USA and Europe [8-10]. Studies indicate that 60% of patients with T2D are obese [11, 12], and up to 43% of patients with BED have obesity [4, 13]. The co-occurrence of T2D and BED adds complexity to the treatment process of both diseases. Treating obese patients with T2D often requires reduced

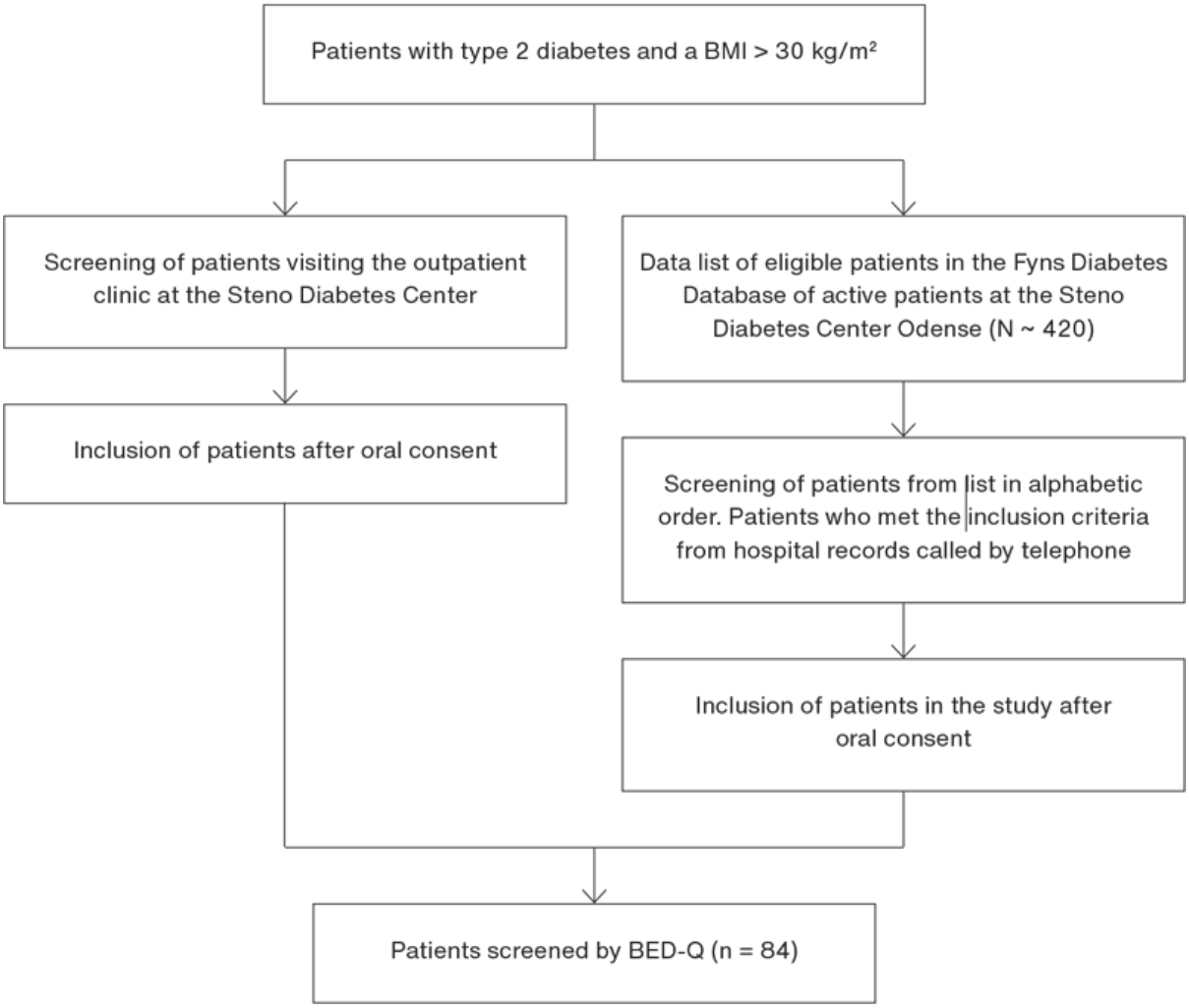
food intake and a transition to a healthier diet. In patients with BED, restrictive eating practices can trigger binge eating episodes, thereby worsening their symptoms [14]. Escalation of binge eating can further increase blood sugar excursions and exacerbate T2D symptoms.

This small-scale study aimed to estimate BED prevalence among adult patients with T2D and a BMI ≥ 30 kg/m^2, which defines obesity. Since we could recruit only a small sample for this study, and because of the wide range of BED reported among patients with T2D, the BMI cut-off was chosen to increase the likelihood of detecting patients with BED. Most patients with BED have a BMI ≥ 30 kg/m^2, and previous studies indicate an increased risk of BED in obese patients [14, 15].

Methods

Patients at the Steno Diabetes Center Odense (SDCO) were included from November to December 2022. The inclusion criteria were a diagnosis of T2D, a BMI ≥ 30 kg/m^2 and 18-70 years of age. The exclusion criteria were non-Danish or non-English speakers, speech and hearing difficulties, cognitive impairment, wheelchair dependency (due to treatment centre facilities), functional disorders, chronic pain or severe mental conditions. Recruitment was conducted through physical attendance or by telephone contact. Telephone-recruited patients were randomly selected from a list of patients generated via the Fyns Diabetes Database (FDDB) (**Figure 1**); psychiatric comorbidity was assessed through electronic health records (EPJ Syd). A total of 90 patients were included in the screening period; six had missing data, reducing the final sample to 84 patients.

FIGURE 1 Patients disposition in the study.



BED-Q = Binge Eating Disorder Questionnaire.

Screening for BED was performed using the Binge Eating Disorder Questionnaire (BED-Q) [16], which consists of nine questions. A score above 10 indicated BED, whereas a score of 8-10 indicated subthreshold BED. The maximum score is 35; the minimum is 0.

Patients scoring above ten on the BED-Q were offered a referral for further BED assessment and treatment at the BED Clinic, Department of Occupational and Environmental Medicine, Odense University Hospital, Denmark. Data were obtained from the BED-Q, the FDDB and the Hospital Electronic Patient Journal (EPJ) after obtaining patient consent. Data included blood and urine tests (HbA_{1c}, estimated glomerular filtration rate (eGFR) and urine albumin/creatinine ratio). These data were extracted from the EPJ. BMI, onset of diabetes and data regarding sex, current age, years with T2D and blood pressure were extracted from the FDDB (**Table 1**).

TABLE 1 Comparison of clinical and biochemical data between the groups.

Patient characteristics	BED (n = 8)	Subclinical BED (n = 7)	No BED (n = 68)	p value: BED versus no BED	p value: BED and subclinical BED versus no BED
Sex, %					
Male	62.5	46.7	61.8	-	-
Female	37.5	53.3	38.2	-	-
Age, mean ± SD, yrs	47.1 ± 9.6	52.3 ± 5.2	55.0 ± 9.0	0.022	0.053
Age at onset of T2DM, mean ± SD, yrs	34.8 ± 7.1	37.1 ± 7.6	42.1 ± 10.0	0.051	NS
Duration of T2DM, mean ± SD, yrs	12.4 ± 6.1	12.4 ± 8.8	13.0 ± 7.4	NS	NS
BMI, mean ± SD, kg/m^2	42.6 ± 18.3	36.3 ± 6.1	36.3 ± 5.4	0.025	NS
HbA_{1c}, mean ± SD, mmol/mol	65.9 ± 8.8	76.3 ± 29.7	62.6 ± 16.4	NS	NS
eGFR, mean ± SD, ml/min./1.73 m^2	86.3 ± 10.6	78.6 ± 25.0	76.5 ± 18.2	NS	NS
Blood pressure, mean ± SD, mmHg					
Systolic	136.4 ± 16.8	121.9 ± 9.8	130.9 ± 18.3	NS	NS
Diastolic	84.6 ± 15.4	80.9 ± 9.3	81.2 ± 12.0	NS	NS
U-albumin/creatinine ratio, mean ± SD, mg/g × 10^{-3}	697.7 ± 1,765.1	477.0 ± 1,288.3	137.8 ± 371.6	NS	NS
Other psychopathology, %[a]	75.5	86.6	10.3	-	-

BED = binge eating disorder; eGFR = estimated glomerular filtration rate; NS = not significant; SD = standard deviation; T2DM = type 2 diabetes mellitus.
a) Any psychiatric diagnosis registered in the hospital patient record.

Ethics

This study was registered and approved by the internal directory in the Region of Southern Denmark.

Statistical analysis

Data were analysed using the statistical software SPSS. The data were divided into three groups: 1) indication of BED, 2) subthreshold BED and 3) no BED. We used ANOVAs with a significance level of p = 0.05.

Results

A total of 84 patients completed the BED-Q: 49 males and 35 females: 9.5% had an indication of BED, 8.3% had subthreshold symptoms and 81.0% had no BED. One person tested positive for another eating disorder and was excluded.

Patients with indication of BED had a significantly lower age (p = 0.022), lower age of diabetes onset (p = 0.051) and significantly higher BMI (p = 0.025) than patients without BED. When comparing patients with BED, subclinical BED and no BED, only age tended to be lower (p = 0.053) in the BED groups.

Discussion

In this small-scale preliminary study, 9.5% of hospital-based obese patients with T2D had an indication of BED, and an additional 8.3% had subthreshold symptoms (total 17.8%). These findings are consistent with those of other studies, showing a wide variation in BED prevalence ranging from 1.2% to 25.6% [7]. While BED is more prevalent among patients with T2D than in the general population, several factors may potentially explain the variance across studies. This includes differences in 1) *diagnostic criteria* (BED was officially included in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) 5 in 2013 and the ICD-11 in 2019); 2) *measure* (no standardised assessment tool specific to BED currently exists); and 3) *sampling*, (some studies sampled from the general population, others from clinical practice).

Binge eating behaviour can be associated with worsened glycaemic control in patients with T2DM; however, not all studies have found significant differences in HbA_{1c} levels between patients with and without BED [7, 17]. We

observed slightly higher HbA_{1c} levels in patients with BED. However, this trend was not statistically significant. The results indicate that BED screening in patients with T2D could be relevant for diagnosing BED and as a potential tool for optimising T2D treatment. Binge eating often triggers feelings of guilt and shame, potentially deterring individuals from seeking healthcare assistance. Routine BED screening among patients with T2D could mitigate these feelings and the associated stigma, thus facilitating open conversations about the disorder.

Patients with T2D and with indication of BED were younger, had earlier onset of T2D and had a higher BMI than those without BED. Severe obesity, combined with younger age, has been associated with increased adverse outcomes in patients with T2D [6]. Early onset BED might accelerate the early onset of T2D, thus accounting for our results. Hence, early BED screening among patients with T2D may potentially diminish the development of complications, provided screening is followed by effective treatment of the eating disorder, presumably influencing blood glucose excursions and factors associated with glycaemic control (e.g., depressive symptoms).

This study has several limitations: 1) Sample size, we only included 84 T2D sufferers; 2) sampling, patients were recruited through the SDCO outpatient clinic, which treats complex T2D; 3) BMI, we only included patients with a BMI $\geq$ 30 kg/m^2. Further studies should include larger samples in more diverse populations across BMI measures, including patients in the primary care setting. Furthermore, the effect of BED treatment in patients with T2D on glycaemic excursions and control warrants further investigation.

Conclusions

This small-scale study suggests an increased prevalence of BED in obese patients with T2D compared with the estimated BED prevalence in the general Danish population. Patients with T2D and BED had a higher BMI and an earlier onset of diabetes than patients without BED. These findings suggest that systematic screening for BED should be conducted in this population. However, large-scale studies and long-term data on treatment effects are needed to substantiate our findings.

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