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Dysfunctional eating in type 2 diabetes mellitus: A multicenter Italian study of socio-demographic and clinical associations

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Abstract *Background and aims:* Dysfunctional eating might impact on the management and metabolic control of type 2 diabetes (T2DM), modifying adherence to healthy diet and food choices.

Methods and results: In a multicenter study, we assessed the prevalence of dysfunctional eating in 895 adult outpatients with T2DM (51% males, median age 67, median BMI 30.3 kg/m^2). Socio-demographic and clinical characteristics were recorded; dysfunctional eating was tested by validated questionnaires (Eating Attitude Test-EAT-26, Binge Eating Scale-BES; Night Eating Questionnaire-NEQ); food intake and adherence to Mediterranean diet were also measured (in-house developed questionnaire and Mediterranean Diet Score−MDS). Obesity was present in 52% of cases (10% obesity class III), with higher rates in women; 22% had HbA1c ≥ 8%. The EAT-26 was positive in 19.6% of women vs. 10.2% of men; BES scores outside the normal range were recorded in 9.4% of women and 4.4% of men, with 3.0% and 1.5% suggestive of binge eating disorder, respectively. Night eating (NEQ) was only present in 3.2% of women and 0.4% of men. Critical EAT and BES values were associated with higher BMI, and all NEQ + ve cases, but one, were clustered among BES + ve individuals. Calorie intake increased with BES, NEQ, and BMI, and decreased with age and with higher adherence to Mediterranean diet. In multivariable logistic regression analysis, female sex, and younger age were associated with increase risk of dysfunctional eating.

Conclusion: Dysfunctional eating is present across the whole spectrum of T2DM and significantly impacts on adherence to dietary restriction and food choices.

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Introduction

The adherence to quantitative and qualitative healthy dieting remains a cornerstone of treatment, but an unmet need, for many patients with type 2 diabetes mellitus (T2DM). The majority of subjects are in the overweight/obese range, and there is an established reciprocal connection between the eating pattern, obesity and T2DM. Dysfunctional eating is likely to favor obesity, in turn leading to T2DM, whereas a regular eating pattern and weight management reduce the risk of T2DM and favorably impact on glucose control [1].

The restriction of food intake to favor weight loss may trigger dysfunctional eating [2,3], sometimes resulting in a formal eating disorder (ED) and further jeopardizing glycemic control. Among EDs, the Binge Eating Disorder (BED), defined as eating an objectively large amount of food over a discrete period of time, accompanied by a sense of lack of control, discomfort and emotional distress, has been recognized as an official psychiatric diagnosis in DSM-5 [2]. The Night Eating Syndrome (NES), characterized by recurrent episodes of night eating, eating after awakening from sleep or by excessive food consumption after the evening meal, did not receive an individual code and was classified under Other Specified Feeding or Eating Disorders (OSFED) [4]. Both BED and NES relatively common in people with obesity [5,6]; a recent systematic review in T2DM individuals reported a prevalence rate of 1.2−8.0% for BED and 3.8−8.4% for NES. Patients with T2DM and BED had higher BMI than patients with T2DM without BED in the two studies where BMI was recorded [7]. There is some controversy on whether BED could increase the risk of future T2DM [8]. Similarly there is uncertainty on the relationship between binge eating-associated T2DM and metabolic control, although the majority of studies showed no association [9−13]. As far as NES is concerned, this ED is frequently associated with BED, particularly in women with obesity [14], and definitely impairs glycemic control in subjects with T2DM [15], being associated with an altered sleep pattern [16].

Also from a qualitative point of view a dysfunctional eating pattern is frequently observed. National and international guidelines for the treatment of diabetes indicate that food choices selected according to the lines of Mediterranean diet style should be preferred, but there is evidence that also in Italy the adherence to Mediterranean diet is far from optimal also in subjects with diabetes, at risk of cardiovascular disease. Although guidelines stress the importance of dietary prescription/counseling, there is scarce attention to lifestyle and trained dietary personnel in favor of pharmacologic protocols.

Aim of the present study was to assess the prevalence of dysfunctional eating in a large population of people with T2DM in Italy recruited in a real-life multicenter clinical setting, as well as its association with socio-demographic characteristics.

Material and methods

Patients

The study involved adult outpatients observed in eight diabetes Italian centers in the period between September 2015 and June 2017. The different centers organized sample collection according to their internal procedures, in order to avoid systematic bias. The only exclusion criteria were a previous diagnosis of psychiatric illness, and inability to fill in the questionnaires because of visual or movement defects. The final database included 895 people with diabetes, whose socio-demographic, anthropometric and clinical data are reported in Table 1. They attended hospital as part of regular follow-up of their disease and check-up of comorbidities.

All subjects signed an informed consent to participate. The study was initially approved by the Ethical Committee of the University Hospital of Bologna, and later by the peripheral centers.

Methods

The Case Report Form was filled in by the diabetologist during the visit. It included demographic data and diabetes history, including current treatment. Body weight and height and waist circumference were measured in light clothing and without shoes to the nearest half-kilogram and half-centimeter, respectively. Biochemical data (plasma glucose, HbA1C, lipid profile, renal and liver function) were measured by standard laboratory techniques in individual centers.

Questionnaires

Study subjects were asked to fill in the questionnaires in a separate silent room either before or following study visit, and the physicians were responsible for checking completeness and, eventually, to remark missing answers for immediate completion. Only the questionnaire on total calorie intake (QMV questionnaire, see below) frequently required more extensive explanation by physicians or nurses. The total time for answering questionnaires was estimated around 30 min. The battery of questionnaires included:

- Eating Attitude Test (EAT, 26 item): a standardized measure of symptoms and concerns characteristic of EDs (any type) [17]; it was used in the 1998 National Eating Disorders Screening Program and has been validated in its Italian version [18]. Values <20 reasonably exclude EDs, whereas values ≥20 should be referred for a diagnostic interview [19].
- Binge Eating Scale (BES, 16 items): used to screen patients for Binge Eating Disorder (BED) [20]. It examines both behavioral signs (eating large amounts of food) and feeling or cognition during a binge episode: loss of control, guilt and fear of being unable to stop eating.

Table 1 Demographic and clinical data in the population with diabetes (mean ± SD; median [interquartile range] for non-normally distributed variables; percent of cases for nominal variables).

	Total (n = 895)	Females (n = 410)	Males (n = 485)	P value[b]
Age (years)	66.1 ± 9.3	65.6 ± 9.6	66.6 ± 9.0	0.123
(<50/51−65/66−80/>80 years, %)	4.2/35.2/54.8/5.8	4.9/36.8/52.1/6.2	3.6/33.8/57.1/5.6	0.466
Diabetes (years)	10.8 ± 8.3	10.6 ± 8.1	11.0 ± 8.5	0.518
(<1/1−10/>10 years, %)	11.6/37.9/50.5	12.0/36.8/51.2	11.3/38.8/49.9	0.837
HbA1c (%)	7.23 ± 1.26	7.21 ± 1.27	7.24 ± 1.24	0.690
(≤7/7−8/8−9/>9%, %)	47.8/30.5/13.3/8.4	46.4/33.4/11.7/8.5	49.0/28.1/14.6/8.2	0.466
Diabetes treatment (Diet/Metformin/Other/Insulin, %)[c]	10.4/70.0/35.0/25.6	11.0/67.9/34.6/22.3	9.9/71.7/35.3/28.3	<0.001
Body Mass Index (kg/m^2)	31.4 ± 6.9	32.7 ± 7.2	30.2 ± 6.5	<0.001
(Normal/Overweight/Obesity class I/class II, class III, %)	17.9/30.1/27.8/13.4/10.8	14.1/25.6/26.3/18.8/15.1	21.0/33.8/29.1/8.9/7.2	<0.001
Smoking (No/Yes/Ex, %)	71.4/18.3/10.3	80.0/14.8/5.2	64.0/21.2/14.7	<0.001
Alcohol drinking (%)	20.6	6.2	35.5	<0.001
Demography (Alone/Living with partner/Widowed, %)	13.7/64.3/22.0	10.3/59.9/29.8	16.7/68.1/15.2	<0.001
Education (Primary/Secondary/High school/Degree, %)	22.1/34.9/33.6/9.5	25.3/34.5/32.0/8.2	19.3/35.2/34.9/10.6	0.295
Job position (Housewife/Active/Retired, %)	12.3/32.3/55.4	25.9/26.9/47.2	0.0/37.5/62.5	<0.001
Psychometric tests				
Eating Attitude Test-26 (score)	10.8 ± 8.1	11.8 ± 8.6	10.1 ± 7.6	<0.001
Dysfunctional eating (%)	14.5	19.6	10.2	<0.001
Binge Eating Scale (score)[a]	4 [8]	5 [9]	4 [6]	<0.001
Bingers/Suspected BED (%)	6.7/2.1	9.4/3.0	4.4/1.5	0.003
Night Eating Questionnaire (score)[a]	10 [7]	10 [6]	10 [6]	<0.001
Night eating syndrome (%)	1.7	3.2	0.4	0.001
Calorie intake				
(QMV questionnaire, kcal/day)	1897 ± 513	1784 ± 449	1993 ± 544	<0.001
Mediterranean Diet Score	29.6 ± 5.7	29.6 ± 5.4	29.7 ± 6.0	0.802
Adherence level (Low/Scarce/Fair/Good/Optimal, %)	0.4/9.1/65.6/24.6/0.4	0.0/8.1/69.3/22.1/0.5	0.6/9.9/62.5/26.8/0.2	0.112

[a] Median [interquartile range].
[b] Student t test, chi^2-test, Fisher exact test or Mann−Whitney test, as appropriate.
[c] Note that the sums exceeds 100% due to combination of more than one treatment (metformin = metformin ± diet; others = any pharmacologic treatment, excluding insulin, ± metformin; insulin = insulin ± any additional treatment.

A score ≥27 conventionally serves as cut-off value for identifying the presence of severe ED, compatible with BED, whereas values ≤16 are used to exclude binge eating [21]. The questionnaire has been validated in its Italian version (I-BED) [22].

- Night Eating Questionnaire (NEQ, 14 items): a measure of the severity of behavioral and psychological symptoms of Night Eating Syndrome (NES) [23,24]. It measures core features (e.g., percentage of calories consumed after dinner and frequency of awakenings and nocturnal ingestions) and associated symptoms of NES (e.g., cravings at night, insomnia, and disordered mood). The total scale exhibited adequate reliability also in its Italian version [25], and a cut-off score ≥30 can be used as a screening value predicting a high risk of NES [23].
- Mediterranean Diet Score (MDS, 11 items): used to evaluate adherence to Mediterranean diet [26], scored as optimal, good, fair, scarce and low at the following cut-offs: ≥45, 44−34, 33−23, 22−12, ≤11.
- Quanto Mangio Veramente (How much do I really eat; QMV, 20 items) [27]: an in-house developed tool providing a semi-quantitative estimation of the average daily calorie intake. The test has been validated in an extensive analysis of patients seeking medical treatment for obesity [28].

Statistical analyses

All data were implemented on a personal computer and analyzed using StatView 5.0™ program (ABACUS Concepts, Inc., Berkeley, CA.). Initially, a descriptive statistics (mean ± standard deviation or median and range) was carried out on the whole dataset, as well as on data split according to gender. Separate analyses were also carried out in relation to duration of diabetes as well as to patients' age and metabolic control. Differences in individual parameters between groups were analyzed by Student's t test, Mann−Whitney test or Kruskal−Wallis test, whenever appropriate. The Chi-square test was used to compare prevalence between groups. Logistic regression analysis was used to identify factors significantly associated with pre-defined values above the cut-offs for normality, after adjustment for socio-demographic conditions and the severity of obesity. The odds ratio (OR), the 95% confidence limits and P values were calculated. The significance limit was set at P = 0.05.

Results

Demographic and clinical characteristics

The whole population was characterized by a median age of 67 and a median BMI of 30.3 kg/m^2, largely representative of the Italian T2DM population (Table 1). Diabetes had been diagnosed by less than one year in 11.6% of cases, with over 50% with long-lasting T2DM, without differences between genders. The metabolic control was optimal (HbA1c $\leq$ 7%) in nearly half of subjects; considering the median age of the population, only 22% of cases could be definitely classified as poorly controlled (HbA1c $\geq$ 8%). Only 10% of participants were simply managed by dieting, 70% received metformin, alone or in association with other glucose-lowering agents (35% of total), 26% were on insulin treatment (more frequently in males). BMI was within normal range only in 18% of participants; a large majority of subjects were in the overweight or obesity range (more frequently in women), with 10% of cases in obesity grade 3 (again, with significantly higher rates in women; P < 0.001). The proportion of smokers and alcohol users was much higher in males.

Notably, no gender related differences were observed in the educational status, whereas the demographic and job status was different between genders, with lower rates of women in active job positions. No inter-center variability was demonstrated in socio-demographic and clinical variables, with the notable exception of BMI, moderately higher in one center, specifically interested in metabolic surgery.

Prevalence of dysfunctional eating

The scores of the different questionnaires are also reported in Table 1. For all tests, the mean values were higher in females, as was the prevalence of tests above the specific cut-offs suggestive of dysfunctional eating. The EAT-26 was positive in nearly one in five women, and a few more were classified by BES as bingers or as suggestive of BED. EAT and BES positive cases were closely associated, with a much higher proportion of BES positive cases among EAT positive individuals (17.5% vs. 7.4%; P = 0.002). Night eating was rare, with only 13 women and 2 men identified as positive by NEQ.

Among socio-demographic characteristics, the prevalence of positive tests was not associated with education, marital status or job; only NEQ positive cases were much more common in individuals living alone (6.0% in single and 2.3% in widowed vs. 1.0% in subjects living with partners; P = 0.012).

The prevalence of critical values at both EAT-26 and BES was closely associated with the progressive increase in BMI class (P < 0.001 for both), whereas critical values at BTO, although unevenly distributed according to BMI (P = 0.007), were particularly present in obesity class III (81.4%) (Fig. 1a). Nearly all NEQ positive cases were clustered in subjects with obesity (3.3% of individuals with obesity), and all but one case were associated with a positive BES score.

Age had a systematic effect on the prevalence of dysfunctional eating. EAT positive cases decreased from 19% in subjects aged <50 to only 10% in subjects >80, whereas BES positive cases decreased from 30% to only 2% (P = 0.003) (Fig. 1b).

Diabetes duration had no systematic effect on the prevalence of positive values in eating questionnaires, whereas the presence of dysfunctional eating was partly associated with metabolic control (Fig. 1c). The prevalence of positive EAT-26 test was independent of HbA1c control, but BES was positive in only 6.3% of cases with HbA1c < 7%, and the prevalence increased to 9.1% with HbA1c in the range of 7−8%, to 11.5% with HbA1c between 8% and 9%, to 12.4% in most decompensated cases (P = 0.075). NEQ positive cases were significantly associated with poor metabolic control (P = 0.040).

### Calorie intake and adherence to Mediterranean diet in relation to dysfunctional eating

The total calorie intake decreased systematically with increasing age class, from 2165 ± 615 kcal/day in subjects younger than 50 to 1803 in subjects older than 80 (P < 0.001, Fig. 2), as well as with diabetes duration and treatment intensification whereas it increased with BMI class from 1898 ± 459 kcal/day in normalweight subjects to 2011 ± 575 in obesity class II-III (P < 0.001), with no effect according to metabolic control. On the contrary, no systematic differences in adherence to Mediterranean diet were observed in relation to sociodemographic parameters, with the notable exception of higher adherence in subjects with higher education levels (not reported in details).

BES and NEQ class were all associated with higher calorie intake, without any difference in relation to metabolic control (Table 2). The estimated total calorie intake increased with increasing BES and NEQ class, with no relation to adherence to Mediterranean diet.

Association of demographic and clinical data with dysfunctional eating

In a multivariable logistic regression analysis, the association of clinical and demographic data were tested for association with the presence of positive tests at EAT-26, BES and NEQ, collectively identified as dysfunctional eating (Table 3). Two models were constructed: in Model 1 the positivity of BES was considered at the low cut-off of 16, in Model 2, the positivity was tested at the high cut-off of 26.

In Model 1, the tests identified 189 individuals with dysfunctional eating (21.5% of total; 29.5% in women, 14.9% in men; P < 0.001); according to model 2 dysfunctional eating was present in 145 cases (16.5%; 22.6% of women, 11.3% of mean). In both cases, young age increased and male sex decreased the risk of dysfunctional eating (Table 3), with no relation with metabolic control, duration of disease, treatment education and job placement.
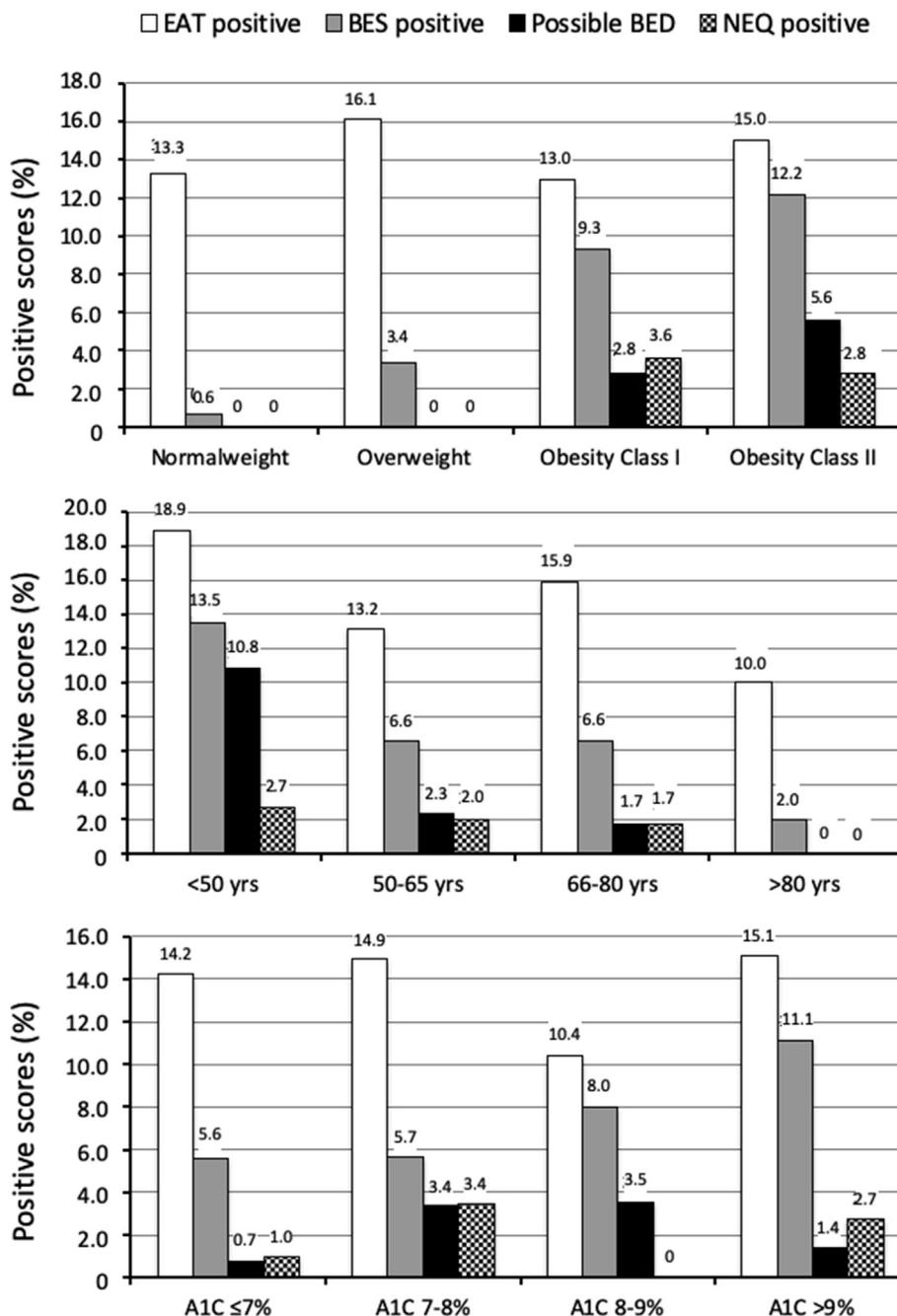
Figure 1 Percent positive cases at different psychometric tests in the whole cohort of subjects with diabetes, according to BMI, age and metabolic control. Note the nearly specular prevalence of positive scores at BES and NES in relation to age and BMI class.

Discussion

The analysis of this large Italian cohort identifies a proportion of individuals with T2DM with a clinically significant dysfunctional eating. The problematic relation with eating is particularly associated with young age, female gender, and high BMI; it carries a specific risk of excess food intake, without any specific selection towards unhealthy food, and does not seem to impact on metabolic control, as measured by glycosylated hemoglobin.

The present study is unique in its methodological framework for the battery of questionnaires used to detect the phenomenon of dysfunctional eating. The term "dysfunctional eating" was used to define high scores at eating questionnaires since a definite diagnosis of Binge Eating Disorder and Night Eating Syndrome would require confirmation by specific interviews (Eating Disorder Examination [EDE] and Night Eating Syndrome History and Inventory [NESHI]). Also the EAT-26 questionnaire, the screening instrument used in the 1998 National Eating Disorders Screening Program, is more properly used to exclude EDs [19]; as expected, the number of EAT positive cases (values ≥20) was much larger than that of subjects with positive scores at BES and NES questionnaires.
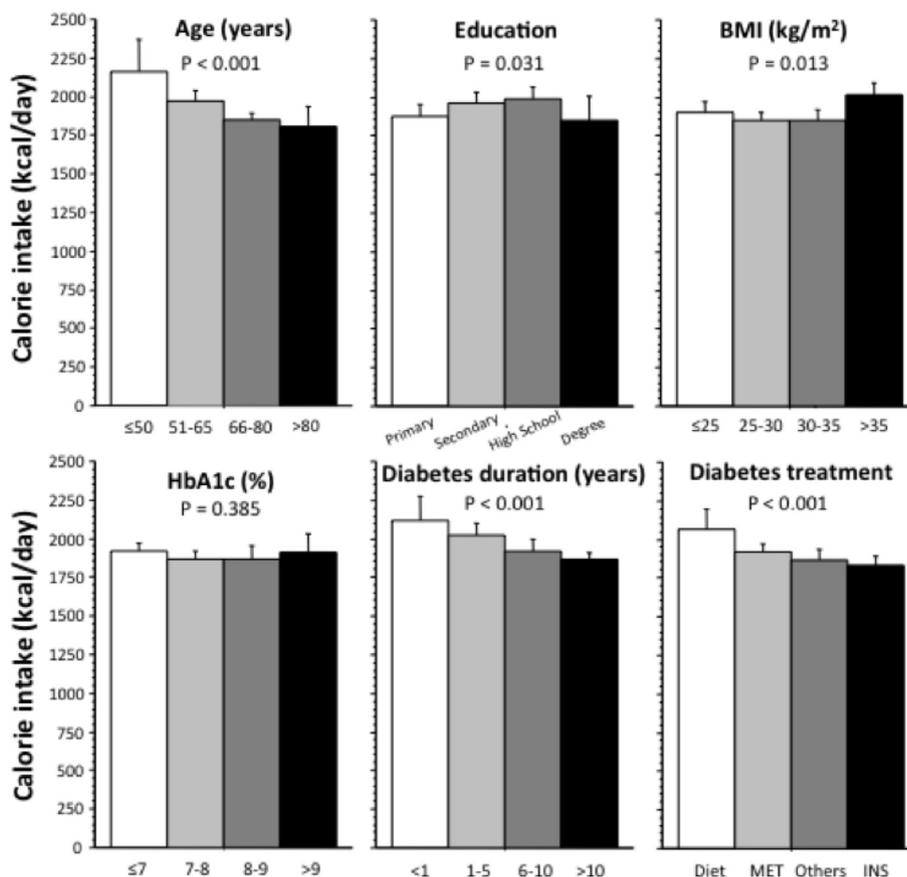
Figure 2 Daily calorie intake in relation to socio-demographic and diabetes characteristics. Note that diabetes treatment is scored from 1 to 4 as simply managed by diet, or diet + metformin (MET), or diet + any other oral agent or injectable GLP-1 RA ± MET (Others), or insulin ± all other agents (INS).

However, very high scores at BES and NES have a high positive diagnostic value and may be confidently used in epidemiological studies.

The prevalence of scores indicative of BED and NES in our study is in reasonable agreement with data from the literature. According to the World Health Organization World Mental Health Surveys Initiative, the prevalence of BED in the general population varies between 1.9% and 2.8% [29] and binge eating represents a potential contributor to obesity, since people with BED are at significantly increased odds of having obesity or extreme obesity compared to those without BED [30]. Similarly, the prevalence of NES is estimated around 1.1–1.2% in the general population [31,32], as high as 6–16% in patients with obesity [33], and up to 20% in bariatric surgery patients [34]. A very recent systematic review in subjects with T2DM reported a point prevalence of 1.2–8.0% for BED in 10 studies and 3.8–8.4% for NES in two studies,

Table 2 Body mass index, metabolic control, food intake and adherence to Mediterranean diet in subjects with type 2 diabetes, grouped according to scores in the questionnaires for eating disorders.

Psychometric evaluation	Body mass index (kg/m^2)	Glycosylated hemoglobin (%)	Food intake[a] (kcal/day)	Mediterranean diet score
No eating disorder (n = 739)	31.2 ± 6.7	7.24 ± 1.23	1915 ± 513	29.7 ± 5.8
EAT score ≥20 (n = 121)	31.4 ± 7.2	7.20 ± 1.42	1809 ± 468	29.5 ± 5.0
ANOVA	F: 0.120; P = 0.729	F: 0.092; P = 0.716	F: 4.547; P = 0.033	F: 0.154; P = 0.694
No binge eating (n = 786)	30.8 ± 6.4	7.20 ± 1.21	1882 ± 483	29.7 ± 5.7
BES score ≥ 16 (n = 55)	35.8 ± 7.2	7.55 ± 1.75	2077 ± 686	30.0 ± 5.8
BES score ≥ 26 (n = 17)	40.3 ± 10.8	7.57 ± 1.00	2220 ± 731	27.8 ± 5.3
ANOVA:	F: 31.222; P = 0.001	F: 2.728; P = 0.065	F: 7.325; P < 0.001	F: 0.987; P = 0.373
No night eating (n = 846)	31.1 ± 6.8	7.23 ± 1.26	1892 ± 503	29.7 ± 5.7
NEQ score ≥30 (n = 15)	36.4 ± 4.7	7.26 ± 1.09	2166 ± 681	29.6 ± 5.9
ANOVA	F: 9.116; P = 0.003	F: 0.007; P = 0.933	F: 4.320; P = 0.038	F: 0.005; P = 0.946

Abbreviations: EAT, Eating Attitude Test; BES, Binge Eating Scale; NEQ, Night Eating Questionnaire.
[a] Measured by the in-house developed questionnaire.

Table 3 Analysis of clinical and socio-demographic factor associated with dysfunctional eating in subjects with type 2 diabetes.

Independent variables	Model 1[a]			Model 2[b]		
	OR	95% CI	P value	OR	95% CI	P value
Age	0.98	0.97−1.00	0.091	0.98	0.96−1.00	0.070
Sex (Males)	**0.42**	**0.30−0.59**	**<0.001**	**0.44**	**0.33−0.63**	**<0.001**
HbA1c (%)	1.04	0.91−1.18	0.605	0.99	0.86−1.15	0.926
Diabetes duration (years)	1.01	0.99−1.03	0.166	1.00	0.98−1.03	0.630
Body mass index (kg/m^2)	**1.06**	**1.04−1.09**	**<0.001**	**1.04**	**1.01−1.08**	**0.002**
Education (grade)	1.08	0.88−1.33	0.469	1.11	0.89−1.40	0.345
Treatment (level)	0.95	0.80−1.12	0.550	0.93	0.78−1.12	0.469
Job placement						
Housewife (reference)	−					
Retired	1.01	0.55−1.84	0.660	1.09	0.57−2.08	0.788
Active	0.66	0.37−1.18	0.160	0.64	0.34−1.20	0.161
Demography						
Single (reference)	−					
Living with partner	0.83	0.48−1.44	0.510	0.62	0.35−1.10	0.105
Widowed	1.01	0.54−1.90	0.966	0.84	0.44−1.61	0.601

Abbreviations: EAT-26, Eating Attitude Test; BES, Binge Eating Scale; NEQ, Night Eating Questionnaire.
Statistically significant data are highlighted by bold character.
[a] Model 1: dependent variable, presence of one or more of the following criteria: EAT-26 ≥ 0, BES ≥16, NEQ ≥30.
[b] Model 2: as Model 1, with BES ≥26.

confirming that differences in the overall prevalence may largely be due to the different tools used for diagnosis [7]. Irrespective of tools, BED was confirmed to be significantly associated with higher BMI in individuals with T2DM in the two studies where BMI was reported [7], as also observed in our setting; although the prevalence of cases with BES ≥ 16 was up to 3.8% in normal-weight or overweight individuals, no cases had values above the diagnostic threshold of 26, which was observed only in subjects with BMI ≥ 30 kg/m^2, and more frequently in the presence of the most severe obesity grades.

The association of both BED and NES with metabolic control of T2DM has been tested in several epidemiological studies with conflicting results [7,9,13,15]. Although in our population glycosylated hemoglobin progressively increased with the severity of BES score, the association failed to reach statistical significance, and no differences at all were observed in relation to NEQ. A post-hoc analysis revealed that BES and NEQ scores were evenly distributed across the whole spectrum of diabetes treatment, and also insulin treatment was not associated with higher risk of BED or NES. This means that treatment was appropriate to counteract the possible unhealthy effects of dysfunctional eating on metabolic control.

The study confirms the susceptibility of women to dysfunctional eating. Most people who develop dysfunctional eating, an estimated 90%, are women. Typically associated with adolescents and young women, the disorder also affects middle-aged or elderly individuals. Some of these women have struggled with disordered eating for decades and the dietary restriction needed to control diabetes may be pivotal to lead to − or maintain − overt disease.

This is one of the few studies where the assessment of eating patterns was coupled with the measurement of food intake and food choices in relation to the Mediterranean diet. Reduced food intake and portion sizes are universally recognized as tools to improve metabolic control [35], and healthy food choices according to the Mediterranean diet are suggested to prevent or reduce the burden of diabetes and its complications [36]. Our data confirm the importance of dysfunctional eating in hampering food restriction [13]; T2DM individuals with high scores at BES and NEQ questionnaire consumed a significantly higher amount of food, although no differences in food selection were detected. On the contrary, systematically associated with several socio-demographic and diabetes-related characteristics, had a null impact on metabolic control. Also adherence to Mediterranean diet was unrelated to clinical variables, suggesting that more intense and continuing educational programs are needed for effective diabetes management [35].

The study has both strengths and limitations. Strengths are the large size of the multicenter sample, which is expected to provide a reasonably external validity of the results, as well as the use of standardized and validated questionnaires, giving an overall picture of the clinical characteristics of our populations. Limits are the lack of confirmatory diagnoses by specific interviews (EDE and NESHI) and of a more comprehensive assessment of the psychological characteristics frequently associated with, and possibly promoting, formal EDs. T2DM individuals with BED or NES have a significantly poorer quality of life and more depressive symptoms than patients without EDs [9,10,15,37].

In summary, the analysis of a large Italian dataset provides evidence that dysfunctional eating, more common in subjects with T2DM than in the general population, is present across the whole spectrum of disease, with specific association in relation to socio-demographic characteristics. Longitudinal studies are awaited to ascertain the possible impact on long-term complications. New anti-diabetes therapies that reduce appetite provide further support to advocate a systematic screening of dysfunctional eating patterns to improve patients' care [35].

Conflict of interest

Acknowledgements

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