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SHORT COMMUNICATION

Prevalence of orthorexic traits in type 2 diabetes mellitus: at the crossroads between nutritional counseling and eating disorders

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Disordered eating, sometimes severe and qualifying as definite eating disorder, is common in persons with type 2 diabetes (T2DM). According to a recent epidemiological survey, disordered eating occurs in 19.6% of women and 10.2% of men among adult Italian T2DM outpatients [1]. The study was based on the Eating Attitude Test-26 (EAT), a questionnaire used to define the risk of eating disorders (normal values, < 20) and validated in its Italian version. The Italian cohort scoring ≥ 20 at EAT (disordered eating) included all subjects with suspected or definite binge eating disorder and night eating syndrome, identified by specific questionnaires, and many more individuals with undefined eating disturbances [1].

In 2000, Bratman introduced the term "orthorexia" [2] to indicate an exaggerated focus on food, often coupled with a sensation of physical impurity due to incorrect food choices, finally leading to malnutrition. In 2016, a novel eating disorder was proposed, "orthorexia nervosa" (ON), characterized by two main diagnostic criteria: (a) obsessive focus on dietary practices believed to promote optimum health (healthy eating); (b) consequent clinically significant distress and/or impairment in important areas of functioning [3]. The disorder is not mentioned as an official psychiatric diagnosis in the most recent Diagnostic and Statistical Manual of Mental Disorders (DSM-5), and the questionnaires for its assessment are not fully validated [4]. ON has been reported in type 1 diabetes, but also in T2DM orthorexic traits might be fostered by continuing nutritional counseling, provided either individually or in group sessions, potentially impacting on food choices and food intake.

In an attempt to further characterize disordered eating in the Italian cohort ($n = 887$, median age, 67; BMI, 30.3 kg/m^2; HbA1c, 7.23% [55 mmol/mol]) (for more detailed study planning, refer to [1]), the Italian survey also included the Bratman test for orthorexia (BTO, 10 items) [2]. Values ≥ 4 indicate an orthorexic tendency, values > 8 indicate overt orthorexia. The results were related to socio-demographic and clinical data, to calorie intake (in-house interview), to adherence to Mediterranean diet (Mediterranean diet score) [1]. In 479 cases enrolled by two diabetes units, data were available on patients' participation in structured group sessions of medical nutrition therapy or nutritional counseling in the preceding twelve months ($n = 210$) versus standard care ($n = 269$). All subjects signed an informed consent to participation and the study was approved by the Ethical Committees of Bologna University Hospital (study 20/2015/O/OssN) and of peripheral centers.

On the basis of EAT and BTO, three groups were identified (Table 1): Group (A) no disordered eating, no orthorexic traits; Group (B) no disordered eating, orthorexic traits; Group (C) disordered eating, where orthorexic traits were always present. Overall, orthorexic traits were present at BTO in 65.5% of individuals, but scores were indicative

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Table 1 Demographic and clinical data in type 2 diabetes (mean ± SD, % of cases for nominal variables), grouped according to scores at Bratman test for orthorexia (BTO: no orthorexia, 0–3; orthorexic traits, ≥ 4) and at Eating Attitude Test-26 (EAT: no disordered eating, < 20; disordered eating, ≥ 20)

	All cases ($n = 887$)	No disordered eating BTO < 4; EAT < 20 ($n = 290$, Group A)	Orthorexic traits BTO ≥ 4; EAT < 20 ($n = 472$, Group B)	Disordered eating BTO ≥ 4; EAT ≥ 20 ($n = 125$, Group C)	*p* value*		
					A versus B	A versus C	B versus C
Gender (F, %)	45.5	38.6	45.6	61.6	0.070	< 0.001	0.002
Age (years)	66.1 ± 9.3	67.8 ± 9.2	65.1 ± 9.3	66.2 ± 9.2	< 0.001	0.101	0.264
(≤ 50/51–65/66–80/> 80 years, %)	4.3/34.9/54.9/5.9	2.4/34.1/53.7/9.8	5.0/36.8/54.2/4.0	5.7/29.8/60.5/4.0	0.011	0.064	0.546
Education (Primary/Secondary/High school/Degree, %)	22.0/35.0/33.7/9.3	29.7/33.3/27.6/9.4	18.9/34.9/35.9/10.3	17.0/39.4/37.2/6.4	0.036	0.066	0.631
Job position (Housewife/Active/Retired, %)	12.1/32.5/55.4	11.9/29.4/58.7	11.2/55.5/33.3	15.5/48.5/36.0	0.650	0.246	0.274
Diabetes duration (years)	10.8 ± 8.2	11.0 ± 8.3	10.5 ± 8.0	11.1 ± 9.0	0.442	0.984	0.545
(< 1/1–10/> 10 years, %)	11.6/37.9/50.5	8.6/39.0/52.4	12.4/38.8/48.8	15.7/32.2/52.1	0.266	0.119	0.366
HbA1c (% [mmol/mol])	7.23 ± 1.26	7.26 ± 1.18	7.22 ± 1.26	7.24 ± 1.42	0.617	0.954	0.864
(≤ 7/7–8/8–9/> 9%, %)	47.7/30.6/13.3/8.4	50.4/27.1/14.8/7.7	46.1/32.1/13.1/8.6	47.5/33.0/10.2/9.3	0.450	0.323	0.846
Diabetes treatment (Diet/Metformin/Other/Insulin, %)†	10.5/71.9/27.4/25.7	9.0/74.4/27.9/23.5	11.3/67.0/27.1/27.3	11.2/70.4/24.8/24.8	0.330	0.867	0.781
Body mass index (kg/m^2)	31.4 ± 6.9	30.3 ± 6.0	31.9 ± 7.2	31.9 ± 7.4	0.001	0.031	0.941
(Normal/Overweight/Obesity, %)	17.7/30.2/52.1	22.1/28.3/49.6	15.5/30.6/53.9	16.0/33.6/50.4	0.009	0.145	0.896
Mediterranean diet score	29.6 ± 5.7	28.4 ± 6.0	30.4 ± 5.6	29.7 ± 4.9	< 0.001	0.028	0.208
Adherence level (Low/Scarce/Fair/Good/Optimal, %)	0.4/9.1/65.6/24.6/0.4	0.7/12.6/68.3/18.9/0.3	0.0/8.5/62.3/28.8/0.4	0.8/3.2/72.0/24.0/0.0	0.003	0.034	0.036
Total calorie intake	1900 ± 513	1991 ± 538	1866 ± 503	1823 ± 466	0.001	0.002	0.365
Recent nutritional counseling (%)‡	43.8 (39.4–48.2)	32.7 (25.4–40.2)	50.2 (44.0–56.0)	43.9 (31.9–55.2)	< 0.001	0.125	0.410

*Student *t* test, chi^2-test, Fisher exact test or Mann–Whitney test, as appropriate

†Note that the sums exceed 100% due to combination of more than one treatment (metformin = metformin ± diet; others = any pharmacologic treatment, excluding insulin, ± metformin; insulin = insulin ± any additional treatment

‡Percent (95% confidence interval). Number of cases are: All groups, $n = 479$; Group A, $n = 150$; Group B, $n = 263$; Group C, $n = 66$)

of ON only in 13/887 cases and none of them was malnourished. These few cases belonged to Group C ($n = 125$), characterized by a larger prevalence of women and lower reported calorie intake, but without any particular socio-demographic condition, metabolic control or obesity grade.

In subjects without disordered eating, orthorexic traits (Group B) identified a cohort with a larger prevalence of women, younger age and higher BMI, higher education, stricter adherence to Mediterranean diet and lower calorie intake, but also higher participation in nutritional counseling programs, compared with Group A.

In a stepwise multivariable logistic regression analysis, younger age [odds ratio (OR) 0.96 per year; 95% confidence interval (CI) 0.94–0.99] and female gender (OR 1.67; 95% CI 1.14–2.49) were the socio-demographic variables associated with orthorexic traits. After additional adjustment for clinical variables, age (OR 0.97; 95% CI 0.95–0.99) and female gender (OR 1.54; 95% CI 1.06–2.23) maintained their association with orthorexic traits, and also BMI significantly increased the risk (OR 1.03 per kg/m^2; 95% CI 1.00–1.06). Finally, all these associations were canceled when the recent participation in nutritional counseling programs was added to the model; in the final model, recent counseling remained the only significant factor, increasing the risk of orthorexic traits by over 50% (OR 1.57; 95% CI 1.02–2.42). Notably, recent counseling was not associated with BTO score above the threshold of orthorexic traits in subjects with disordered eating (Group C).

In conclusion, this is the first study identifying the prevalence of orthorexic traits in T2DM patients, assessing BTO in a large Italian cohort. In general, young, well-educated women with high BMI are at higher risk. The limits of the study are its cross-sectional design, not determining the influence of orthorexic traits on clinical management, and the sole use of self-reported questionnaires. EAT is subject to a risk of false-positive results in comparison to structured interviews, whereas BTO is not fully validated in the literature.

Nonetheless, the report provides important clues. The relation with healthy eating (including planning, preparation and consumption of healthy food), which very rarely reaches the cutoff of ON (only 1.5% in our cohort), is strengthened by nutritional counseling in subjects without disordered eating. Notably, orthorexic traits, with/without disordered eating, were accompanied by stricter adherence to Mediterranean diet, not by better metabolic control, but BMI was significantly higher.

The difficulties in disentangling healthy eating from orthorexic traits or frank ON were also observed in non-diseased persons, where "healthism" may be a positive behavioral characteristic [5], difficult to explore through BTO tests, having low specificity for ON. The test was the basis for the development of a more complex questionnaire (ORTHO-15) [4], now recognized as the standard diagnostic tool for orthorexia nervosa [3]. However, also ORTHO-15 fails to distinguish between attention to healthy eating and the pathological obsessiveness with healthy meal planning, making orthorexia of scarce clinical significance in T2DM, at least in the absence of disordered eating. The overlap between the two different conditions becomes more intriguing in chronic metabolic diseases (e.g., diabetes or obesity), per se associated with disordered eating. T2DM individuals, with/without obesity, are at the crossroads between the need for adopting healthy food choices, and the psychosocial distress associated with recommended/self-imposed dietary restrictions, sometimes turning into disordered eating. Nutritional programs, however associated with orthorexic traits, do not constitute a risk for disordered eating, frank ON and malnutrition.

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Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest in relation to the material presented in the study.

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Informed consent disclosure All subjects signed an informed consent to participation.

Prior publications The population reported in the study was part of a previous report: Petroni et al., Nutr Metab Cardiovascular Dis 2019;29:983–990.

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