- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

Orthorexia nervosa in a sample of Italian university population

L'ortoressia nervosa in un campione di popolazione universitaria italiana

LILIANA DELL'OSSO[1], MARIANNA ABELLI[1], BARBARA CARPITA[1], GABRIELE MASSIMETTI[1], STEFANO PINI[1]*, LUIGI RIVETTI[2], FEDERICA GORRASI[2], ROSALBA TOGNETTI[2], VALDO RICCA[3], CLAUDIA CARMASSI[1]

*E-mail: stefano.pini@med.unipi.it

[1]Department of Clinical and Experimental Medicine, Section of Psychiatry University of Pisa, Italy
[2]Prorectorate to Students Affairs and Right to Education, University of Pisa, Italy
[3]Department of Neurosciences, Psychology, Drug Research and Child Health (NEUROFARBA), University of Florence, Italy

SUMMARY. Aims. To investigate frequency and characteristics of orthorexic behaviours in a large university population. **Methods.** A total of 2826 individuals volunteered to complete an on-line anonymous form of ORTO-15 questionnaire, a self-administered questionnaire designed and validated to evaluate orthorexic symptomatology. As made in previous studies, an ORTO-15 total score lower than 35 has been used as an optimal threshold to detect a tendency to orthorexia nervosa. A specifically designed form was also used to collect socio-demographic variables. **Results.** Overall, 2130 students and 696 university employees belonging to University of Pisa (Italy) were assessed. Orthorexic features had a frequency of 32.7%. Females showed a significantly higher rate of over-threshold scores on ORTO-15, a lower BMI, a higher rate of underweight condition and of vegan/vegetarian nutrition style than males. **Discussion.** Orthorexia nervosa defined as a "fixation on healthy food", is not formally present in DSM-5. The emergence of this condition as a new, possible prodromal of a psychological syndrome, has been recently emphasized by an increasing number of scientific articles. From our sample of university population emerged that being vegetarian or vegan, under-weight, female, student and being interested in the present study were significantly predictive of orthorexic tendency. **Conclusions.** Our data contribute to define the new conceptualization of orthorexia nervosa. Further studies are warranted in order to explore the diagnostic boundaries of this syndrome, its course and outcome, and possible clinical implications.

KEY WORDS: orthorexia nervosa, eating disorders, university population, healthy eating, healthy food.

RIASSUNTO. Scopo. Valutare la frequenza e le caratteristiche dei comportamenti ortoressici in una vasta popolazione universitaria. **Metodi.** Un totale di 2826 individui hanno volontariamente completato in forma anonima l'ORTO-15 presente online, questionario autosomministrabile disegnato e validato con lo scopo di valutare la sintomatologia ortoressica. Come già fatto in studi precedenti, un punteggio totale all'ORTO-15 inferiore a 35 è stato utilizzato come soglia ottimale per evidenziare una tendenza per l'ortoressia nervosa. Inoltre, è stata anche usata una scheda specifica per raccogliere le variabili socio-demografiche. **Risultati.** Sono stati valutati, nel complesso, 2130 studenti e 696 dipendenti universitari appartenenti all'Università di Pisa. I sintomi ortoressici si sono presentati con una frequenza del 32,7%. Le femmine presentavano una percentuale significativamente maggiore di punteggi sopra-soglia all'ORTO-15, un BMI minore, una maggiore presenza di condizione "sottopeso" e di stile di alimentazione vegano/vegetariano rispetto ai maschi. **Discussione.** L'ortoressia nervosa, definita come una "fissazione per il mangiare sano", non è inclusa formalmente nel DSM-5. L'emergere di questa condizione come un nuovo possibile prodromo di una sindrome psicologica è stato recentemente enfatizzato dal numero sempre crescente di articoli scientifici. Dal nostro campione di popolazione universitaria emerge che l'essere vegetariani o vegani, la condizione sottopeso, l'appartenere al sesso femminile, l'essere studenti e interessati al presente studio sia significativamente predittivo di un'inclinazione verso l'ortoressia. **Conclusioni.** I nostri dati contribuiscono a definire la nuova concettualizzazione dell'ortoressia nervosa. Saranno necessari sicuramente altri studi per esplorare i confine diagnostici di questa sindrome, il suo decorso, "l'outcome" e le possibili implicazioni cliniche.

PAROLE CHIAVE: ortoressia nervosa, disturbi dell'alimentazione, popolazione universitaria, mangiare sano, cibo salutare.

INTRODUCTION

The term orthorexia nervosa (ON) refers to individuals highly concerned with proper, safe, healthy nutrition, and the fact that this eating style can be considered a new psychological syndrome has been emphasized by an increasing number of scientific articles in the last few years[1].

ON is mainly characterized by highly sensitive cognitions and worries about healthy nutrition leading to such an accurate food selection that a correct diet becomes a very relevant part of life. The term orthorexia nervosa, derived from the Greek words *orthos* (correct) and *orexis* (appetite), was coined by Bratman[2]. Individuals with higher tendency to orthorexic symptoms are primarily characterized by nutrition-

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

al beliefs leading to a greater importance given to the perceived healthiness and nutritional properties rather than to taste and enjoyment of the foods[3,4]. In some cases there is a strict focus on biological-non dairy vegetarianism, veganism or raw food. The foods quality, source, packaging and processing are daily carefully checked, due to pervasive preoccupations with health from food and the desire to improve one's own physical health and well-being, often leading to complex eating behaviours requiring long period of time. Apart from meals, a great amount of time is characterized by intrusive, food-related thoughts, with a chronic worry about food flaws and health threats, resulting in a severe distress or impairment of relational, school and work domains[5-8].

This condition is not formally present in DSM-5[9], neither in the section on disorders requiring more scientific research nor in ICD-10[10]. Considering the heterogeneity of features above described, it is still object of debate whether ON can be considered a single, defined syndrome or a variance of other syndromes or merely a behavioral culturally-influenced attitude[11,12]. Moroze et al.[8] proposed four diagnostic criteria for ON, based on the review of literature[2,6,13], underscoring the fact that these criteria will have to be corroborated from validation studies along the lines of other DSM-5 diagnostic entities before they could be accepted into a future version of the DSM.

In particular, criterion B refers to impairment, caused by obsessional preoccupation of physical health due to an unbalanced diet and specify the severe distress or impairment of social, academic, or vocational functioning owing to obsessional thoughts and behaviors focusing on patient's beliefs about "healthy eating". Vandereycken[12] observed that ON features are a well known diagnostic concept among professional experts in the field of eating disorders, suggesting that ON should be considered as a "genuine syndrome", worthy of more interest in research and clinical practice. As far as the diagnostic boundaries of ON are concerned, is of note that this condition shows similarities and differences with anorexia nervosa (AN) and obsessive-compulsive disorder (OCD), which are themselves often comorbid[14,15].

Even if ON and AN share abnormal eating attitudes and behaviours, and ON and AN patients both have a poor insight about the consequences of their disorders[16,17], the core beliefs of the two syndromes are different in nature[1,18]. As a matter of fact, AN patients are mainly worried about body image, the quantity of food and gaining weight. Their eating pattern is the consequence of the need of losing weight and the self-esteem depends on the weight lost. However, it is of note that severe orthorexic attitude towards food can risk to evolve in AN[16]. On the other hand, considering OCD, both syndromes share high anxiety traits, need to exert control, perfectionism and concerns about contamination, whereas the most significant difference is the ego-syntonic content of obsessions characterizing individuals with higher tendency to orthorexic symptoms , with a limited insight[2].

There is only limited epidemiological information on ON and some methodological problems (small sample size, no data on representative community samples, assessment in high-risk groups) featured these studies, determining as consequence a difficult generalization of the results[3]. The average prevalence rate of orthorexic symptoms has been found to be 6.9% for the general population and 35-57.8% for high-risk groups (dieticians, nutrition students, other healthcare professionals including medical students, artists, fitness participants and performance artists)[3]. To date, very few studies[19-22] have been carried out to assess prevalence and specific characteristics of orthorexic behaviours in samples of students or of university population. The aim of our study is to investigate frequency and characteristics of tendency to ON in a large university population (students and university employees).

METHODS

This study was conducted form March 2014 to September 2014 upon agreement with University of Pisa Institutional Governance (Rectorate)[23]. Participants in the study were from Pisa's Athenaeum and were enrolled from the whole students and university employed population. Overall, 2826 individuals volunteered to complete an on-line anonymous form of ORTO-15 questionnaire. The request to participate and the description of purposes of the study were posted on a university web site. Volunteers did not receive any kind of payment or complementary gift for participating in the survey. In addition to the questionnaire, an appropriate self-report form was used to collect socio-demographic variables. An informed consent was obtained contextually to the material sent on-line to each participant. Data were retrieved in a database for statistical analyses.

Instruments

The ORTO-15

The ORTO-15 is a questionnaire developed for the assessment of orthorexic symptoms and consists of 15 multiple-choice items[24]. The test was created starting from a previously existing model used by Bratman on a population in the USA[25]. Answers that indicated a tendency to ON were given a score of "1", while the "healthier" ones had a score of "4". The sum of the scores was the final score of the test. The threshold value of the ORTO-15 questionnaire was based on the study sample (404 subjects)[13,24]. The total structure of the test and of the single questions was obtained at the end of a series of preliminary questionnaires that were reviewed, after administration to "pilot" samples. The ORTO-15 items aim to investigate typical pathological behavioral patterns as well as cognitive and emotional features of this condition[13]. Authors proposed different cut-offs (i.e. <35, <40) but an ORTO-15 <35 score has been found to ensure the best predictive capability to correctly identify orthorexic symptoms through the highest sensitivity (86.5%), specificity (94.2%) and negative predictive value (91.1%) among the tested cut-offs[16,26-28]. Therefore the ORTO-15 showed a good reliability and validity, including internal consistency[13]. In the present study, according to previous research[24], the most restrictive threshold has been adopted (<35), to guarantee the highest specificity for orthorexic behaviours in a population of university students and employees.

Statistical analyses

We utilized Chi-square tests to compare rates of: satisfaction, underweight subjects, subjects with ON, vegan and vegetarian subjects observed in the different demographic categories. We utilized T-tests for unpaired data to compare the mean levels of BMI and Orto-15 total score observed in the different demographic

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

categories. A multiple logistic regression analysis was performed to identify the variables best predicting the presence of ON. All statistical analyses were carried out using the Statistical Package for Social Science, version 22.0 (SPSS Inc. Chicago 2013).

RESULTS

A spontaneous enrollment included a total of 2826 subjects. Of these, 2130 (75.4%) were student and 696 (24.6%) were employees (teachers, technical or office workers). Overall, 82.9% individuals of the whole sample of responders expressed a positive assessment of the project (Table 1).

A 40.6% of males and a 59.4% of females composed our sample. Age ranged from 18 to 70 years, with a mean age of 28.9±11.39 years. To perform statistical analyses with the aim of evaluating possible significant differences depending on age range, we decided to use the third quartile of age distribution as cut-off variable, splitting the sample in subjects with ≤29 years and ≥30 years.

Table 1. Demographic characteristics of the sample.

Age (years): mean±SD, Min, Max	28.90±11.39, 18, 70
Age classes	n (%)
≤29 years >29 years	2141 (75.8) 685 (24.2)
Gender	n (%)
Males Females	1678 (59.4) 1148 (40.6)
Professional role	n (%)
Students University personnel	2130 (75.4) 696 (24.6)
High schools	n (%)
Liceum Technical/Professional	2204 (78.0) 622 (22.0)
Parents' educational level	n (%)
≤8 years >8 years	677 (24.0) 2149 (76.0)
Type of diet	n (%)
Standard Vegan/vegetarian	2513 (88.9) 313 (11.1)
BMI: mean±SD, Min, Max	22.55±3.63, 14.34, 73.46
Weight categories	n (%)
Underweight Normal weight Overweight	204 (7.2) 2120 (75.0) 502 (17.8)
ORTO-15 total score: mean±SD, Min, Max	37.13±4.14, 21, 53
Orthorexia symtpoms	n (%)
Present absent	925 (32.7) 1901 (67.3)
Appreciation of the project	n (%)
Yes No Missing information	2342 (82.9) 471 (16.7) 13 (0.4)

**The presence of Orthorexia behaviours was based on the ORTO-15 test using 35-score threshold.*

We found that the 78% of the sample previously attended "Lyceum" (an university-oriented type of high school), while the 22% attended a professional/technical type of high school. Regarding to parents, 2149 subjects (76%) stated that at least one of their parents attended more than 8 years of school. The mean BMI value among the sample was 22.55±3.63, with a 7.2% of underweight, a 75% of healthy weight and a 17.8% of overweight individuals. The vegetarian/vegan diet seemed to be significantly represented among responders (11.1%). Finally, the ORTO-15 score ranged from 21 to 53 points, with a mean value of 37.3±4.14. According to the <35 threshold, 32.7% presented higher tendency to ON (Table 1).

As previously described, we compared, among demographic categories, rates of response, satisfaction, underweight, presence of orthorexic symptoms, vegan/vegetarian nutrition style rate and the mean levels of BMI and ORTO-15 total score. Females showed a significantly higher rate of vegan/vegetarian nutrition style (13.8% vs 7.1%), a significantly higher rate of <35 score on ORTO-15 (35.3% vs 28.9%) and a significantly lower total mean score on the questionnaire than males (36.96±4.23 vs 37.38±3.98), a lower BMI index (21.91±3.83 vs 23.40±3.07) and a higher rate of underweight condition (10.5% vs 28.9%). Furthermore, among females there was a wider spread of positive assessment for the project (88.1% vs 76.2%) than males (Table 3 and 4). Regarding to age, we founded that in the group with ≤29 years of age there was a higher rate of subjects with orthorexic symptoms compared to older ones (34.3% vs 27.9 %) and a lower mean score on ORTO-15 (36.99±4.23 vs 37.59±3.80) and BMI index (22.20±3.49 vs 23.65±3.82). Furthermore in this group (≤29 years), underweight individuals were significantly more represented (8.3% vs 3.8%) than older ones (Table 2 and 3).

Regarding to professional role, students showed a higher frequency of orthorexic symptoms compared to university employees (34.9% vs 26.1%) and a lower ORTO-15 score (36.93±4.23 vs 37.74±3.79), as well as a lower BMI (22.25±3.55 vs 22.63±3.65) and a higher percentage of underweight subjects (8.1% vs 4.5%) (Table 2 and 3).

We found that subjects who had previously attended "lyceum" or with a parent education level of > 8 school years more frequently showed a lower ORTO-15 score (37.04±4.12 vs 37.46±4.19 and 37.01±4.12 vs 37.53±4.16 respectively), a lower mean BMI (22.38±3.54 vs 23.15±3.86 and 22.39±3.66 vs 23.07±3.48 respectively) and a higher underweight rate (8.1% vs 4.2% and 7.9% and 5.0% respectively) (Table 2 and 3).

Regarding to nutrition styles, vegetarian or vegan subjects showed a lower mean BMI (21.94±3.40 vs 22.63±3.65) and were more frequently underweight (10.2% vs 6.8%) compared with subjects with an omnivorous diet. Moreover, vegetarian or vegan subjects showed lower scores on ORTO-15 (35.23±4.81 vs 37.37±3.98) and a significantly higher rate of orthorexic symptoms (53% vs 30.2%) (Table 3).

Finally, with respect to positive/negative appreciation of the survey, subjects who gave positive judgment reported a higher underweight rate (7.8% vs 4.7%), lower BMI (22.46±3.68 vs 22.96±3.55), a higher rate of orthorexic symp-

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

Table 2. Categorical outcome variables: groups' comparisons.

Groups	Vegan/vegetarian n (%)	Underweight n (%)	Orthorexia symptoms n (%)	Project appreciated n (%)
Age classes				
≤29 years	240 (11.2)	178 (8.3)	734 (34.3)	1777 (83.2)
>29 years	73 (10.7)	26 (3.8)	191 (27.9)	565 (83.3)
χ^2, p	0.11, p=.740	64.75, **p<.001**	9.37, **p=.002**	0.00, p=.998
Gender				
Males	82 (7.1)	28 (2.4)	332 (28.9)	872 (76.2)
Females	231 (13.8)	176 (10.5)	593 (35.3)	1470 (88.1)
χ^2, p	29.69, **p<.001**	64.75, **p<.001**	**12.47, p<.001**	68.95, **p<.001**
Professional role				
Students	240 (11.3)	173 (8.1)	743 (34.9)	1780 (83.8)
University personnel	73 (10.5)	31 (4.5)	182 (26.1)	562 (81.4)
χ^2, p	0.25, p=.618	9.99, **p=.002**	17.78, **p<.001**	1.97, p=.160
High schools				
Liceum	231 (10.5)	178 (8.1)	727 (33.0)	1832 (83.5)
Technical/professional	82 (13.2)	26 (4.2)	198 (31.8)	510 (82.4)
χ^2, p	3.33, p=.068	10.42, **p=.001**	0.24, p=.622	0.35, p=.554
Parents' educational level				
≤8 years	84 (12.4)	34 (5.0)	205 (30.3)	571 (84.8)
>8 years	229 (10.7)	170 (7.9)	720 (33.5)	1771 (82.8)
χ^2, p	1.43, p= .232	5.99, **p=.014**	2.29, p=.131	1.45, p=.228

toms (34.2% vs 25.7%) and lower score (36.95±4.11 vs 38.01±4.19) on ORTO-15 (Table 3).

The multiple logistic regression analysis model revealed, as shown in Table 4, that being vegetarian or vegan (OR=2.5, $CI_{95\%}$=1.98-3.20), underweight (OR=1.4, C.I. 1.03-1.88), female (OR=1.2, $CI_{95\%}$=1.00-1.41), student (OR=1.44, , $CI_{95\%}$=1.06-1.96), and appreciating the project (OR=1.4, C.I. 1.13-1.79), were significantly predictive of high levels of orthorexic features.

DISCUSSION

This study evaluated the frequency of ON in a large university population, including students from all Degree Courses, as well as university personnel (teachers and technical-administrative). We collected data that were heterogeneous in terms of type of degree courses, age range, educational level and other demographic variables, with respect to previous studies carried out among university students from health education faculties (Medicine, Nutritional Science, Biology, Sport Sciences)[21,28-30] or on specific high-risk populations (dietitians, yoga practitioners, athletes, performing artists, fitness participants)[7,17,26,31]. Overall, in our study, 32.7% of participants presented symptoms of ON using a cut-off point <35 at the ORTO-15 total score. Donini et al.[13] found that using a threshold score of 35 points, the questionnaire had an efficacy of 86.5%, with a high specificity (94.2%) and a high negative predictive value (91.1%). Ramacciotti et al.[16], in a study on general population, found a frequency rate of orthorexic behaviours of 57.6% using a cut-off of <40 and a rate of 21% using a more stringent cut-off of <35 at the ORTO-15. Moreover, Segura-García et al.[26] found a prevalence rate of orthorexic symptoms of 28% in an athlete's sample, whereas Bo et al.[28] reported a rate of 25.9% in a student's sample, both using a cut-off of <35. These data, as a whole, suggest that orthorexic symptoms are identifiable in university (students and personnel) as in the general population, and they are in line with results from previous studies carried out among university students. Bo et al.[28] reported that ON was frequent in their cohort of freshmen attending university course of dietetic and sport sciences, showing a prevalence of about 25% that was considered higher than that found in the general population (about 7%). A Turkish study[21] underlined that 43.6 % of medical students showed a preoccupation with healthy food, as evaluated by the ORTO-11 test, a Turkish version of ORTO-15, and Varga et al.[30], in a large Hungarian study of 810 university students, reported over 70% having orthorexic tendencies (with a <40 cut-off point). Finally, American studies described a prevalence of orthorexic features ranging from 69%[32] to 82.8%[33] among undergraduate students.

In the literature, there is no agreement in ascribing ON to a specific gender. Some studies reported no significant gender differences[7,22,26,30] whereas others showed a higher prevalence of orthorexic symptoms among males[21,24]. Our data are aligned to those studies indicating a higher frequency of orthorexic features in females than in males, with a frequency of 53.4% and 40.6% respectively[16,19,26,34]. Females have more interest on proper nutrition because they are more careful about their physical appearance, weight control, consume

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

Table 3. Quantitative outcome variables: groups' comparisons.

Groups	BMI mean±SD	ORTO-15 Total score mean±SD
Age classes		
≤29 years >29 years t, p	22.20±3.49 23.65±3.82 -8.85, **p<.001**	36.99±4.23 37.59±3.80 -3.50, **p<.001**
Gender		
Males Females t, p	23.40±3.07 21.91±3.83 12.18, **p<.001**	37.38±3.98 36.96±4.23 2.70, **p=.007**
Professional role		
Students University personnel t, p	22.25±3.55 23.47±3.70 -7.59, **p<.001**	36.93±4.23 37.74±3.79 -4.76, **p<.001**
High schools		
Liceum Technical/professional t, p	22.38±3.54 23.15±3.86 -4.48, **p<.001**	37.04±4.12 37.46±4.19 -2.26, **p=.024**
Parents' educational level		
≤8 years >8 years t, p	23.07±3.48 22.39±3.66 4.29, **p<.001**	37.53±4.16 37.01±4.12 2.85, **p=.004**
Type of diet		
Standard vegan/vegetarian t, p	22.63±3.65 21.94±3.40 3.13, **p=.002**	37.37±3.98 35.23±4.81 7.55, **p<.001**
Weight		
Underweight Normal weight t, p	–	36.38±4.36 37.19±4.11 -2.69, **p=.007**
Orthorexia symptoms*		
Present Absent t, p	22.34±3.61 22.65±3.63 -2.13, **p=.033**	–
Appreciation of the project		
Yes No t, p	22.46±3.68 22.96±3.55 -2.73, **p=.006**	36.95±4.11 38.01±4.19 -5.10, **p<.001**

**The presence of orthorexia symptoms was based on the ORTO-15 test using 35-score threshold.*

Table 4. Binary logistic regression analysis to predict presence of Orthorexia symptoms based on ORTO-15 test using 35-score threshold.

	B (SE)	*Odds ratio*	*C.I.$_{95\%}$*	*p*
Gender *(ref. category: male)*	*0.175 (0.087)*	*1.191*	*1.004-1.412*	***.044***
Age *(years)*	*-0.001 (0.006)*	*0.999*	*0.987-1.011*	*.880*
Type of diet *(ref. category: standard)*	*0.922 (0.123)*	*2.514*	*1.975-3.201*	***< .001***
High schools *(ref. category: technical/ professional)*	*-0.020 (0.104)*	*0.980*	*0.800-1.201*	*.849*
Professional role *(ref. category: student)*	*-0.365 (0.157)*	*1.440*	*1.058-1.960*	***.020***
Parents' educational Level *(ref. category: <8 years)*	*0.106 (0.102)*	*1.112*	*0.910-1.359*	*.300*
Appreciation of the project *(ref. category: not appreciated)*	*0.352 (0.117)*	*1.422*	*1.130-1.789*	***.003***
Weight categories* *(ref. category: normal weight)*	*0.330 (0.153)*	*1.391*	*1.031-1.876*	***.031***
Constant	*-1.213 (0.227)*			

**underweight vs normal weight*

less caloric food, and are, on average, more influenced by the media. As a confirm of these observations, Brytek-Matera et al.[22], in a sample of university students, indicated that in females a strong preoccupation with healthy eating was positively correlated with appearance evaluation and body areas satisfaction. This relationship could indicate that as female student's satisfaction with the size and physical attractiveness is improved, their preoccupation with healthy food increases.

Notwithstanding, the fact that ON was present among male university population deserves some comments. Ramacciotti et al.[16] hypothesized that ON in men may be apparently related to issues regarding health. Indeed, men take care of themselves healthfully, following socially and culturally accepted terms of beauty. A different, but not alternative hypothesis is that orthorexic behaviors in males, especially in youngsters, is associated to an attitude with obsessive-compulsive personality features and polarization to "male ideals" as muscularity, strength, power and athleticism[24].

The presence in our sample of a lower BMI index and a higher rate of underweight in females, as compared to males, raises a more specific question on whether ON may have a "common core" with anorexia. Phenomenology of eating disorders has been changing over time and concerning this, Segura-García et al.[27] reported that orthorexic prodromal symptoms were highly prevalent among patients with anorexia or bulimia and tended to increase after treatment. These authors warrant further studies to clarify whether ON may be associated with clinical improvement of anorexia or bulimia or represents residual symptomatology responsible for a greater number of relapses and recurrences of eating disorders. In our sample, most subjects with higher tendency to orthorexic symptoms showed a lower BMI than those

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

without ON. One reason explaining this association might be that subjects with obsession for healthy foods, loose moderation and balance in their feeding, ending up to present loss of body weight and reduction of their BMI. These individuals might seem generally less concerned about their weight, appearing more interested in food quality rather than in food quantity, if compared to subjects with anorexia. However, it has been noted that, in some cases, weight loss could become a significant feature, with the possible risk of shifting towards spurious forms of anorexia. In this regard, Vandereycken[12] described some cases arrived to malnutrition and sometimes to underweight, resembling this clinical picture similar to anorexia, after a selective and restrictive eating pattern.

The relationship between specific nutrition styles and development of ON has been described in literature. Some studies reported correlations with being generically on a diet[26,28] or seeking healthy food or showing restrictive behaviors and weight control tendency[19,27,35]. Interestingly, recent models of eating disorders emphasize the importance of ruminative thinking in the occurrence of unhealthy eating behavior[36-41]. Rudiger and Winstead[42] have demonstrated body-related co-rumination to be related to body-related cognitive distortions and disordered eating in 203 young adult women. Most recently, Naumann et al.[43] showed that rumination led to a significant increase of desire to abstain from eating in a group of patients with anorexia and of desire to binge in patients with bulimia nervosa. These studies suggest a detrimental effect of rumination on eating-related symptoms in eating disorders that we argue should be further addressed in ON.

In our study, we found a rate of vegetarians and vegans of 6.9 % and of 1.7%, respectively. These rates are similar to those found in general population (6.5% and 0.6%). These two styles were more widely represented in students and administrative/technical employees than in academic groups. In addition, vegetarian/vegan subjects showed a higher rate of orthorexic symptoms and underweight, than the omnivorous individuals. Data from our survey, confirm previous results[16,24] concerning an association between ON and specific nutrition styles (vegetarianism, veganism, raw foodists and macrobiotics).

As mentioned above, we splitted the sample in two ranges of age (subjects with ≤29 years and ≥30 years). Our data suggest that symptoms of ON are more common among individuals with less than 30 years of age who are mainly students, characterized by a high level of education. We, therefore, agree with previous studies suggesting a correlation between tendency to ON, young age and good level of schooling[19,21,27]. Other studies showed no significant differences in distribution of ON depending on age[7,16,28,34,44]. Only one study, to our knowledge, found a higher prevalence of ON in older age (36±17)[24].

Despite several strengths of our study, there are some unavoidable limitations. First, this is not an epidemiological study and, therefore, our data are not representative of the general population. Furthermore the fact that this study was carried out in a single university could restrict the generalizability of our results to the entire Italian university population. The study may contain a selection bias due to the higher appreciation of the project (overall 82.9% individuals of the whole sample of responders expressed a positive assessment) and therefore possible greater sensibility and interest to orthorexia showed by responders with respect to non-responders. A further limitation is that the use of only one questionnaire evaluating orthorexic features, did not permit us to evaluate the relationship between ON and other psychopathological dimensions, as obsessive-compulsive disorder and AN. Indeed, preoccupations with food in individuals with higher tendency to orthorexic symptoms has been reported to be associated to the presence of obsessive-compulsive symptoms[2,6,13,16], whereas eating concerns and restraint, adherence to the diet as a value for self-esteem, deviation from the diet as an index of relevant loss of control have been considered shared features by AN and ON individuals[3,45].

In conclusion, most striking results of our study are provided by logistic regression analysis showing that female gender, younger age range, being student, being vegetarian/vegan and underweight, were the factors significantly predictive of ON.

Further studies are warranted in order to explore the diagnostic boundaries of this syndrome, its course and outcome, and the possible therapeutic strategies.

Conflict of interest: the authors report no conflicts of interest in this work.

REFERENCES

1. Brytek-Matera A. Orthorexia nervosa - an eating disorder, obsessive-compulsive disorder or disturbed eating habit? Arch Psychiatr Psychother 2012; 1: 55-60.
2. Bratman S. Health food junkie. Yoga Journal 1997; 8: 42-50.
3. Varga M, Dukay-Szabó S, Túry F, van Furth EF. Evidence and gaps in the literature on orthorexia nervosa. Eat Weight Disord 2013; 18: 103-11.
4. Marazziti D, Presta S, Baroni S, Silvestri S, Dell'Osso L. Behavioral addictions: a novel challenge for psychopharmacology. CNS Spectr 2014; 19: 486-95.
5. Aarnio K, Lindeman M. Magical food and health beliefs: a portrait of believers and functions of the beliefs. Appetite 2004; 43: 65-74.
6. Mathieu J. What is orthorexia? J Am Diet Assoc 2005; 105: 1510-2.
7. Aksoydan E, Camci N. Prevalence of orthorexia nervosa among Turkish performance artists. Eat Weight Disord 2009; 14: 33-7.
8. Moroze RM, Dunn TM, Craig Holland J, Yager J, Weintraub P. Microthinking about micronutrients: a case of transition from obsessions about healthy eating to near-fatal "orthorexia nervosa" and proposed diagnostic criteria. Psychosomatics 2014; 56: 397-403.
9. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders: DSM-5. Washington, DC: American Psychiatric Publisher, 2013.
10. World Health Organization. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. Geneva: World Health Organization, 1992.
11. Bartrina JA. Orthorexia or when a healthy diet becomes an obsession. Arch Latinoam Nutr 2007; 57: 313-5.
12. Vandereycken W. Media hype, diagnostic fad or genuine disorder? Professionals' opinions about night eating syndrome, orthorexia, muscle dysmorphia, and emetophobia. Eat Disord 2011: 19: 145-55.
13. Donini LM, Marsili D, Graziani MP, Imbriale M, Cannella C. Orthorexia nervosa: validation of a diagnosis questionnaire. Eat Weight Disord 2005; 10: 28-32.
14. Halmi KA, Tozzi F, Thornton LM, et al. The relation among perfectionism, obsessive-compulsive personality disorder and ob-

- Copyright - Il Pensiero Scientifico Editore downloaded by IP 18.97.9.172 Wed, 07 Oct 2026, 17:27:02

sessive compulsive disorder in individuals with eating disorders. Int J Eat Disord 2005; 38: 371-4.
15. Altman SE, Shankman SA. What is the association between obsessive-compulsive disorder and eating disorders? Clin Psychol Rev 2009; 29: 638-46.
16. Ramacciotti CE, Perrone P, Coli E, et al. Orthorexia nervosa in the general population: a preliminary screening using a self-administered questionnaire (ORTO-15). Eat Weight Disord 2011; 16: 127-30.
17. Alvarenga MS, Martins MC, Sato KS, Vargas SV, Philippi ST, Scagliusi F. Orthorexia nervosa behavior in a sample of Brazilian dietitians assessed by the Portuguese version of ORTO-15. Eat Weight Disord 2012; 17: 29-35.
18. Chaki B, Pal S, Bandyopadhyay A. Exploring scientific legitimacy of orthorexia nervosa: a newly emerging eating disorder. J Hum Sport Exerc 2013; 8: 1045-53.
19. Ba ci Bosi AT, Camur D, Güler C. Prevalence of orthorexia nervosa in resident medical doctors in the faculty of medicine (Ankara, Turkey). Appetite 2007; 49: 661-6.
20. Varga M, Máté G. Eating and body image related problems in orthorexia nervosa. In: The 17th International conference on Eating Disorders, Abstract Book. Tirol, Austria: Congress Centrum Alpbach, 2009.
21. Fidan T, Ertekin V, I ikay S, Kirpinar I. Prevalence of orthorexia among medical students in Erzurum, Turkey. Compr Psychiatry 2010; 51: 49-54.
22. Brytek-Matera A, Donini LM, Krupa M, Poggiogalle E, Hay P. Orthorexia nervosa and self-attitudinal aspects of body image in female and male university students. J Eat Disord 2015; 3: 2.
23. Dell'Osso L, Abelli M, Pini S, et al. Dimensional assessment of DSM-5 social anxiety symptoms among university students and its relationship with functional impairment. Neuropsychiatr Dis Treat 2014; 10: 1325-32.
24. Donini LM, Marsili D, Graziani MP, Imbriale M, Cannella C. Orthorexia nervosa. A preliminary study with a proposal for diagnosis and an attempt to measure the dimension of the phenomenon. Eat Weight Disord 2004; 9: 151-7.
25. Bratman S, Knight D. Health Food Junkies: orthorexia nervosa: overcoming the obsession with healthful eating. New York: Broadway Books, 2000.
26. Segura-García C, Papaianni MC, Caglioti F, et al. Orthorexia nervosa: a frequent eating disordered behavior in athletes. Eat Weight Disord 2012; 17: 226-33.
27. Segura-García C, Ramacciotti C, Rania M, et al. The prevalence of orthorexia nervosa among eating disorder patients after treatment. Eat Weight Disord 2014; 20: 161-6.
28. Bo S, Zoccali R, Ponzo V, et al. University courses, eating problems and muscle dysmorphia: are there any associations? J Transl Med 2014; 12: 221.
29. Korinth A, Schiess S, Westenhoefer J. Eating behaviour and eating disorders in students of nutrition sciences. Public Health Nutr 2010; 13: 32-7.
30. Varga M, Thege BK, Dukay-Szabó S, Túry F, Van Furth EF. When eating healthy is not healthy: orthorexia nervosa and its measurement with the ORTO-15 in Hungary. BMC Psychiatry 2014; 14: 59.
31. Eriksson L, Baigi A, Marklund B, Lindgren EC. Social physique anxiety and sociocultural attitudes toward appearance impact on orthorexia test in fitness participants. Scand J Med Sci Sports 2008; 18: 389-94.
32. Shah SM. Orthorexia nervosa: healthy eating or eating disorder? Dissertation. Charleston: Eastern Illinois University, 2012.
33. McInerney-Ernst EM. Orthorexia nervosa: real construct or newest social trend? Dissertation. Kansas City: University of Missouri-Kansas City, 2011.
34. Aruso lu G, Kabakçi E, Köksal G, Kutluay Merdol T. Orthorexia nervosa and adaptation of ORTO-11 into Turkish. Türk Psikiyatri Derg 2008; 19: 283-91.
35. Kinzl JF, Hauer K, Traweger C, Kiefer I. Orthorexia nervosa in dieticians. Psychother Psychosom 2006; 75: 395-6.
36. Veronese A, Zanon S, Zanetti T, Santonastaso P, Favaro A. Perception of social rank and submissive behavior in eating disorders. Riv Psichiatr 2010; 45: 41-8.
37. Mazzei C, Castellini G, Benni L, et al. Sexuality and eating disorders. Riv Psichiatr 2011; 46: 122-8.
38. Silva JR. Restraint eating and sensitivity to stress: preliminary experimental evidence. Riv Psichiatr 2011; 46: 300-4.
39. Grasso M, Nazzaro F, Vona L, Capacchione G, Loriedo C. Maturity fears and weight phobia in eating disorders: research of a relationship. Riv Psichiatr 2012; 47: 319-26.
40. Castellini G, Zagaglioni A, Godini L, et al. Religion orientations and eating disorders. Riv Psichiatr 2014; 49: 140-4.
41. Caslini M, Rivolta L, Zappa LE, Carrà G, Clerici M. Psychotherapeutic treatment of eating disorders improve dissociative experiences and impulse regulation but not alexithymia. A case series report. Riv Psichiatr 2015; 50: 143-7.
42. Rudiger JA, Winstead BA. Body talk and body-related co-rumination: associations with body image, eating attitudes, and psychological adjustment. Body Image 2013; 10: 462-71.
43. Naumann E, Tuschen-Caffier B, Voderholzer U, Caffier D, Svaldi J. Rumination but not distraction increases eating-related symptoms in anorexia and bulimia nervosa. J Abnorm Psychol 2015; 124: 412-20.
44. Valera JH, Acuña Ruiz P, Romero Valdespino B, Visioli F. Prevalence of orthorexia nervosa among ashtanga yoga practitioners: a pilot study. Eat Weight Disord 2014; 19: 469-72.
45. Fairburn CG, Harrison PJ. Eating disorders. Lancet 2003; 361: 407-16.