

Orthorexia nervosa: A preliminary study with a proposal for diagnosis and an attempt to measure the dimension of the phenomenon

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ABSTRACT. Aim: To propose a diagnostic proceeding and to try to verify the prevalence of orthorexia nervosa (ON), an eating disorder defined as "a maniacal obsession for healthy foods". **Materials and Methods:** 404 subjects were enrolled. Diagnosis of ON was based on both the presence of a disorder with obsessive-compulsive personality features and an exaggerated healthy eating behaviour pattern. **Results:** Of the 404 subjects examined, 28 were found to suffer from ON (prevalence of 6.9%). The analysis of the physiological characteristics, the social-cultural and the psychological behaviour that characterises subjects suffering from ON shows a higher prevalence in men and in those with a lower level of education. The orthorexic subjects attribute characteristics that show their specific "feelings" towards food ("dangerous" to describe a conserved product, "artificial" for industrially produced products, "healthy" for biological produce) and demonstrate a strong or uncontrollable desire to eat when feeling nervous, excited, happy or guilty.

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INTRODUCTION

For some time now, the mass-media and experts in the field of nutrition have noticed a new eating behaviour disorder not yet recognised as a disease by DSM IV, called "orthorexia nervosa (ON)" (1-5).

Emphasised by the worrying level of excessive alarm towards food that the media has produced (mad cow disease, contaminated chicken, mercury poisoning in fish, etc...), the discordant personality aspect of ON forces the individual into an exasperated choice of food based solely on "health" aspects. This can lead these individuals to follow strict diets which eliminate entire categories of food and which consequently lead to a shortage of essential nutrients, the modification of social and personal relationships and the alteration of the general psycho-physical state (3,6-9).

The term "orthorexia" is derived from the Greek "orthós" meaning right, correct, and "orexis" meaning hunger. These terms then devolve to represent "maniacal obsession" for healthy and correct food. This disorder is expressed not in a "quantitative"

manner as in anorexia (AN) and bulimia (BN), but in a "qualitative" way (3, 8).

Generally, orthorexia can be considered when the eating disorder is long term and not transitory, and when such behaviour has a significant negative impact on the quality of life of the individual (3, 4,6-8). Orthorexic subjects, in extreme cases, will prefer to starve themselves rather than eat foods which they consider "impure" and thus harmful to their health (3, 6-8).

In view of these considerations, orthorexia could be considered to be a more or less serious personality or behavioural disturbance which has very little to do with trends or behaviour linked to religious or philosophical customs.

As previously stated, this phenomenon is recent. Despite the attention paid to the subject by the mass-media in particular, ON does not yet have a universal term of definition nor a nosologic classification and consequently lacks valid diagnostic criteria. There is a dramatic absence of scientific literature: recent research on med-line (www.ncbi.nlm.nih.gov, www.medscape.com) found only one study (10) which was written in Swedish,

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indexed without an abstract and consequently very difficult to find.

The aim of this study was a tentative proposal for the diagnosis of ON and the verification of its prevalence.

MATERIALS AND METHOD

Sample selection

The study was carried out at the Institute of Food Sciences, University of Rome "La Sapienza", directed by Prof. Carlo Cannella between February and August 2001.

Enrolment of volunteers and the collection of data were both carried out by trained persons with appropriate knowledge of Food Science and in Research on Eating Behaviour. 404 subjects were enrolled in this way. Spontaneous enrolment gave us subjects with various different occupational characteristics: employees came from the Institute of Biochemistry "La Sapienza" University, from the Ministry of the Italian Air Force, from the television channel Sat 2000; students enrolled from the Plinio Scientific High School and from "La Sapienza" University; parents of children in the 4th class of the San Giuseppe Junior School and parents of patients attending the Pediatric Dietetics Service at the Umberto I Hospital in Rome; a group of residents from Frosinone, near Rome, etc, etc.

Subjects under the age of 16 were excluded because they were considered insufficiently autonomous in the choice of their food.

Diagnosis of orthorexia

Based on the concept that ON is a disorder characterized by a combination of eating, behavioural and obsessive-phobic personality traits, we diagnosed ON in the presence of both:

- "health fanatic" eating habits. In particular we emphasized the choice made by the subject of food normally considered "healthy" (fresh, wholemeal, biological produce....) and that not normally considered healthy (frozen, tinned....). To classify each food group selected (cereals, milk, meat, fish, vegetables, fruit, fast-food, snacks, sweets and biscuits, drinks), a points system was used which scored "0" for eating behaviour considered "healthy" and "1" for "non healthy". The final result was the ratio of the sum of points awarded for each single item with the maximum of points that each subject could obtain without including the items to which we failed to obtain a response. From the distribution

of points obtained it was decided to consider those subjects who were classified below the 25th percentile (score <0.57) as "health fanatic".

- obsessive-compulsive traits and phobia linked to the personality of the subject, based on scale 7 of the Minnesota Multiphasic Personality Inventory (MMPI) test (11) considering a score of >65 for women and >66 for men as modified.

Anthropometric and socio-cultural data, eating habits

The volunteers were given an anonymous, self completion questionnaire which collected the following information:

- personal details (sex, age, marital status, children, level of education, profession (Table 1);
- anthropometric data: weight and stature. The body mass index (BMI) was calculated from weight (in kg) and stature (in m) on the basis of $BMI = \text{weight}/\text{height}^2$. Subjects were then classified into 4 groups on the basis of BMI (12) (Table 1);
- data regarding the eating regime normally followed (for clinical reasons, vegetarian,

TABLE 1
Sample characteristics.

		%
Gender	Male	41.9
	Female	58.1
Marital status	Single	60.0
	Widowed	0.8
	Separated	2.5
	Married	36.7
Children	Yes	37.3
	No	62.7
Education	Junior	2.2
	High	16.7
	Senior high	47.3
	Degree	33.8
Profession	Student	37.8
	Manual worker	3.4
	Clerk	31.0
	Tradesman	5.3
	Professional	21.2
	Other (housewife, pensioner, unemployed)	1.3
BMI	BMI <18,5 kg/m ²	2.6
	BMI 18.5-24.9 kg/m ²	72.2
	BMI 25.0-29.9 kg/m ²	22.8
	BMI 30.0-34.9 kg/m ²	1.8
	BMI 35.0-39.9 kg/m ²	0.6
	BMI ≥40 kg/m ²	0

BMI: Body mass index.

crudist, vegan, ...), the reason for this choice, the source generally followed for nutritional information (family doctor, nutritionist, mass media, books, health club...), the food provider used (supermarket, biological food farm.....), any use of supplements;

- personal application of a "value" to production /conservation characteristics of food (fresh, preserved, home-made, industrial, biological, bio-technological, wholemeal), using adjectives such as healthy, tasty, genuine, dangerous, natural, artificial ;
- sensation of subjects regarding the desire to eat, using the EES-11 test, a modified version of the Emotional Eating Scale produced by Arnow B. et al. (13), in order to identify the food linked emotional indicator. Subjects were asked to connect their emotions (excitement, depression, irritation, happiness, inadequacy, solitude, nervousness, concentration,

confusion, guilt) with their desire to eat which was classified in 5 different levels ranging from "no desire" to "uncontrollable urge".

Elaboration of data

Student t test and ANOVA were used to assess differences in group means. Pearson's χ^2 test was used to compare the observed frequencies of categories to the expected frequencies if the null hypothesis were true. Statistical significance was set at the $p < 0.05$ level. Data were collected and analysed using SPSS software for Windows 10.0 (SPSS Inc 1989-1999).

RESULTS

Prevalence of orthorexia in the study groups

Out of 404 subjects examined in the study group, 28 (6.9%) resulted as suffering from

TABLE 2
Characteristics of the orthorexic subjects compared with the rest of the sample.

		Orthorexia %	Normal eating behaviour and, altered MMPI %	"Health-fanatic" eating and normal MMPI %	Normal eating behaviour and normal MMPI %	χ^2	p
Whole sample		6.9	15.8	17.1	60.2		
BMI (Kg/m ²)	< 18	0	10.0	50.0	40.0	16.2	0.18
	18.1-25.0	6.5	14.5	18.2	60.8		
	25.1-30.0	9.2	16.1	11.5	63.2		
	30.1-35.0	0	42.9	14.2	42.9		
Marital status	Single	7.0	11.2	14.2	59.6	16.8	0.05
	Widowed	10.0	20.0	40.0	30.0		
	Separated	6.8	10.2	19.7	63.3		
	Married	0	0	66.7	33.3		
Children	Yes	7.6	11.0	21.4	60.0	5.2	0.16
	No	6.1	18.4	15.6	59.9		
Profession	Student	7.7	24.5	13.3	54.5	31.3	0.07
	Manual worker	7.7	15.3	38.5	38.5		
	Clerk	5.1	12.0	17.1	65.8		
	Tradesman	5.0	0	20.0	75.0		
	Professional	7.5	12.5	16.2	63.8		
	Housewife	0	0	100.0	0		
	Pensioner	0	33.3	0	66.7		
	Unemployed	0	100.0	0	0		
Information sources	Medical Doctor	7.3	18.2	20.0	54.5	7.6	0.82
	Nutritionist	9.4	10.4	18.7	61.5		
	Specialist	0	15.0	20.0	65.0		
	Mass media	6.1	18.3	15.2	60.4		
	Fitness centers	12.5	12.5	16.7	58.3		
Diet	Yes	7.1	20.2	18.2	54.5	2.32	0.51
	No	7.0	14.6	16.3	62.1		
Use of supplements	Yes	10.6	15.1	12.1	62.2	2.6	0.46
	No	6.1	16.0	17.3	60.6		

BMI: Body mass index.

orthorexia, 64 (15.8%) had normal eating behaviour but an altered MMPI, 69 (17.1%) had “health fanatic” eating problems but a normal MMPI and the remaining 243 (60.2%) had normal eating behaviour and normal MMPI.

Physiological, socio-cultural and psychological characteristics of orthorexic subjects

We compared the characteristics of the orthorexic subjects with the rest of the study group (Table 2).

In particular, it was noted that the age of orthorexic subjects is slightly higher (36.00 ± 17 vs 33.2 ± 14 ; $F=3.6$, $p=0.01$) and the prevalence of orthorexia is higher in males (11.3% vs 3.9%; $\chi^2 13.9$, $p=0.003$). In the orthorexic group there was a lower percentage of subjects with a high level of education (67.9% vs 81%; $\chi^2 19.9$, $p=0.02$) and orthorexic subjects tend to use more home-made or biologically produced foods (53.6% vs 30.1%; $\chi^2 48$, $p=0.000$).

No difference was noted between orthorexic subjects and the rest of the study group as to BMI distribution, marital status, presence of children in the family, profession or preferred source of food information. The percentage of people using food supplements or following a diet was the same for orthorexic subjects and the rest of the study group, as was the reason for following a particular eating regime.

Generally, orthorexic subjects do not attribute different values such as “healthy, tasty, genuine.....” to production/conservation method. However, it was noted that orthorexic subjects rarely judged “fresh” products as “genuine” (3.8% vs 16.3%), more often judged “conserved” products as “dangerous” (50% vs 26.7%), “industrial” products as “artificial” (88.5% vs 69.3%) and “biological” products as “healthy” (53.8% vs 40.1%).

As to the emotivity of subjects regarding the impulse to eat (EES-11 test), it was noticed that orthorexic subjects more frequently showed strong or uncontrollable urges to eat, together with a feeling of guilt (25.9% vs 13.0%; $\chi^2=21.7$, $p=0.04$), of nervousness (48.2% vs 35.0%; $\chi^2=32.1$, $p=0.001$), of excitement (22.2% vs 10.6%;) or of happiness (37% vs 23.5%). In the last two cases the difference was not statistically important. No differences were noted between the urge to eat and sensations such as depression, irritation, inadequacy, solitude, concentration or confusion. However, it should be noted that even though the actual result was significantly different to the expected result, in the table which relates the various groups of subject (orthorexic, “normal “”) to the different manifestation of emotivity regarding the

TABLE 3
Emotional state of subjects regarding the desire to eat: differences between orthorexic subjects and the rest of the study group.

Strong or uncontrollable desire to eat	Orthorexic subjects %	Rest of the study group %	χ^2	p
Excitement	22.2	10.6	16.5	0.17
Depression	44.4	39.0	20.02	0.07
Irritation	18.5	14.8	12.24	0.43
Happiness	37.0	23.5	9.31	0.68
Inadequacy	12.5	10.8	7.56	0.82
Loneliness	40.7	39.6	33.94	0.001
Nervousness	48.2	35.0	32.13	0.001
Attention	7.4	4.2	6.86	0.87
Confusion	11.5	8.3	13.77	0.31
Guilt	25.9	13	21.73	0.04

urge to eat when feeling “lonely”, no difference was noted between the orthorexic subjects and the rest of the study group (Table 3).

DISCUSSION

The first to speak about orthorexia was Dr. Steven Bratman, author of the book “Health-Food Junkies”(3). Frequently, eating behaviour such as followed in veganism or macrobiotics and which eliminates large classes of food considered harmful can result in orthorexia when the obsession for food reaches maniacal levels. The same cannot be said for vegetarians who do not eat meat or fish (but who introduce milk, eggs and other animal products into their diet) who choose this eating regime because they respect the lives of other living creatures, and not because they have a maniacal fear for their health (3, 6).

The desire to eat healthy foods is not in itself a disorder, but the obsession for these foods, together with the loss of moderation and balance and the withdrawal from life caused by this food habit, can then lead to orthorexia. The causes of orthorexia, which are often hidden behind a very deep and seemingly attractive belief, may be found in the illusion of total health, with no pathological risks, the desire for total control of one’s own life, a latent conformism (“healthy eating” may be an alibi in order to follow the socially and culturally accepted terms of beauty, without having to confess a belief in them), the search for an identity and spirituality in eating behaviour, the belief that one’s own theories on eating are the

best (social isolation). The orthorexic sufferer spends a great deal of his time thinking about food, frequently dedicating his whole existence to the planning, purchase, preparation and consumption of the food that he considers healthy. His eating behaviour becomes the only one possible, and generates a feeling of superiority over the lifestyle and eating habits of other people.

These facts cause the orthorexic subject to have an obsessive relationship with food itself and lead to an exasperated search for “healthy” food. Bratman’s analysis, seconded by other authors (14), underlines the possible consequences of orthorexia as malnutrition owing to a result of lack of nutrients, distortion of priorities (orthorexic subjects give food a priority importance on the scale of the values of life), social isolation (the orthorexic subject does not share the same eating habits as the rest of the social group), obsessive habits and related repercussions on the lifestyle of orthorexic subjects (taking their own food wherever they go; the need to follow a strict diet, to weigh all food, to carefully calculate everything that is eaten, etc...), specific problems which are also evident in other eating behaviour pathologies conditioned by the “perfection” factor (15).

Diagnosis of orthorexia

Validated criteria do not exist for the diagnosis of orthorexia. Considering the two elements that characterize this problem – the obsessive-compulsive disorder and modified eating behaviour of a “qualitative” type, we suggest a protocol for diagnosis which consists of:

- scale 7 for psycho-asthenia (48 items) of MMPI (11). The MMPI test was chosen because it is currently considered a point of referral both in psychodiagnosis (16) and in clinical psychology. From the test (which has 13 scales: 3 for validity and 10 clinical), level 7 was used as it indicates psychoasthenia, which is particularly indicated in explicit, obsessive behaviour (expressed in actions) or implicit behaviour (incapacity to escape from one’s own recurrent ideas). In particular, the scale underlines certain traits such as anxiety, low self-esteem, uncertainty, methodical habits, strong self-control. In Bratman’s test for orthorexia, these traits are shown to distinguish the orthorexic subject who, for these very reasons, is an obsessive, anxious patient, rather than a careful, guided consumer. The orthorexic subject concentrates his methodical, critical ritual into his eating pattern. Perhaps he is pushed into this by the long, insistent series of publicity which emphasises nutritional

aspects such as consumption of biological products and crudism, and proposes them as a “healthy” and resolute remedy.

This study could be limited by the use of one, single scale from the MMPI test, and the absence of other psychodiagnostic control tests, but the accuracy and high sensitivity of scale 7 of the MMPI can compensate this limit. This scale was very sensitive in the definition of orthorexia as far as “health-fanatic eating” behaviour is concerned.

- a questionnaire on eating behaviour which examines the quality, rather than the quantity. Orthorexic subjects are in fact obsessed by the type of food rather than its quantity as happens in AN and BN. Furthermore, the questionnaire investigated the choice of the subjects between so called “health foods” and those not. Wholemeal, fresh, biological and non-industrial products were considered as “healthy”, taking into account public opinion on the subject, publicity campaigns and the mass media.

As we said, diagnostic criteria of ON are not well defined and this is, to our knowledge, the first attempt to define these criteria using objective evaluation of the two elements that characterize this problem – the obsessive-compulsive disorder and modified eating behaviour of qualitative type. The lack of a reference gold-standard, however, makes a bias for definite statement unavoidable.

Selection of sample subjects

As far as the subjects of this study are concerned, a defect in the selection method must be pointed out, in that the subjects completed the questionnaire only on the basis of voluntary enrolment. This could limit the possibility of extending the results to cover the entire population and consequently implies the necessity of further studies.

There was a high percentage of non-married subjects in our volunteers, with a higher level of education than the average national population. Perhaps this caused the results of the questionnaire to be more credible, but as previously stated, this could in some way give a distorted view of the phenomenon.

Also regarding the BMI, we had a bias in the selection of subjects in that our volunteers in the study group were underweight respectively in 2.6% and 1.8% of cases, normal weight in 72.2% and 73.6%, and overweight in 22.8% and 20.0%, while the obese subjects were 2.4% and 4.6%. These data do not correspond to the results of the Multiscopo enquiry carried out by ISTAT (Italian national survey group) in 1999 which showed the Italian population over the

age of 18 to be underweight in 3.6% of cases, normal weight 53.8%, overweight in 33.4% (with a net prevalence of men at 42.4% vs 26.6%), and obese 9.1% (with no difference between male and female) (17).

Prevalence of orthorexia

At the moment, no data exist on the prevalence of orthorexia in Italy or in other countries. Despite this, Bratman in his book (3) describes a particularly alarming situation regarding the population of the USA. Other researchers have expressed perplexity regarding Bratman's statements, and claim that the phenomenon is not so serious as to cause great alarm (14). These different interpretations on the prevalence of the problem were the reason for our study.

In our study group the prevalence of the phenomenon was 6.9% (28 out of 404 subjects examined). We are not faced with an epidemic, as claimed by Bratman, but with a relatively widespread pathology to which can be added groups of subjects with occasional orthorexic behaviour attributed to facts and news being brought to the attention of the general public (18, 19).

Characteristics of orthorexic subjects

Contrary to what we had expected, considering women to be more careful of their physical appearance and their eating habits (20), we found that in our study group, there was a higher prevalence of orthorexia in men. It is possible that with the present trend towards the presence of men in the world of "body culture" (meaning the attention given to one's physical aspect in order to live up to the high level stereotypes dictated by society), males may have found an optimal behaviour pattern in the "health-fanatic" food choice. Aesthetic appearance and health seem, therefore, to be two very important reasons for following a healthy diet (21). However, with men being new to this situation, they tend to be more anxious and susceptible to the social messages that bombard them about food from publicity and promotions.

The orthorexic subjects in our study group have a lower level of education than the rest of the group; however, this type of patients does not need a good culture level to be able to criticize the alarming messages that frequently arrive from publicity, nor to understand the real cause of the problems. The orthorexic subject considers as correct only what he understands, and he only understands the over-simplified theories (6).

As to the source of food information used, contrary to what we expected, we did not find

any difference between the orthorexic subjects and the rest of the study group. This could be explained by the fact that the orthorexic person does not question himself about the correctness of his eating behaviour and consequently about the source of information used, because he is mixed up in a behavioural pathology which reduces the capacity to criticize. Emotivity and obsession prevail over reasoning, and therefore over the need to obtain information from qualified, reliable sources.

Belief and emotivity in the orthorexic subject

We evaluated the subjects' beliefs and attitudes that define the quality of knowledge that a person has regarding a certain object. The value attributed to the object (in this case, food) in fact determines the relationship between the consumer and the market (in the orthorexic subject, this could be a biological value, for example) and conditions him towards the consumption of certain foods in preference to others (22, 23). We tried to evaluate the intensity and the importance of the "value" that sufferers attribute to the various characteristics of food products (conserved, biological, wholemeal etc.) by analysing the results for opinions and attitudes. As could be foreseen, the orthorexic subjects in our study group tend, for the very reason of the particular nature of their eating behaviour disturbances, to attribute characteristics that show their specific "feelings" towards food. They do, in fact, more frequently use the adjective "dangerous" to describe a conserved product, "artificial" for industrially produced products, "healthy" for biological produce. Contrary to what we expected, the orthorexic subjects in our study group rarely classed "fresh" products as "genuine", which also shows that they connect these foods more to the concept of "controlled" rather than "freshness".

To identify the food emotion indicator of orthorexic subjects we used a modified version of the Emotional Eating Scale, EES-11. The orthorexic subjects in our study group showed a strong or uncontrollable desire to eat when feeling nervous, excited, happy or guilty. This may show how, at the base of their eating behaviour, there prevails a generalized state of anxiety that is compensated through food, rather than through a physiological stimulus or pleasure (24). The resulting feeling of guilt shows the obsessive anguish over the possible loss of control that could lead the subject to make "a choice of any food and not solely that which is considered safe".

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