

Symptoms of Orthorexia Nervosa are associated with time spent on social media: a web-based survey in an Italian population sample

M.G. TARSITANO¹, R. PUJIA¹, Y. FERRO¹, E. MOCINI², G. PRONI¹, F.R. LENZI³, A. PUJIA¹, E. GIANNETTA¹

¹Department of Medical and Surgical Sciences, Magna Graecia University, Catanzaro, Italy

²Department of Experimental Medicine, Sapienza University of Rome, Rome, Italy

³Department of Movement, Human and Health Sciences, "Foro Italico" University of Rome, Rome, Italy

Abstract. – OBJECTIVE: Orthorexia Nervosa (ON) is an eating disorder of growing interest that is characterized by an obsession with healthy eating. Nowadays, people spend an increasing amount of time on social media, which may negatively impact eating behaviors. The aim of this study was to investigate the relationship between social media usage and risk of ON.

SUBJECTS AND METHODS: We conducted an online survey using the 10-item Italian-Düsseldorf Orthorexia Scale questionnaire (I-DOS). A total of 4,107 individuals participated and were classified according to sex, age, education level, marital status, BMI, main occupation, and diet.

RESULTS: The prevalence of ON was 28.5%. Participants who reported using social media for over 60 minutes per day had a higher prevalence of ON than those using social media for less than 15 minutes per day.

CONCLUSIONS: The results of this study suggest that longer time spent on social media is associated with ON.

Key Words:

Orthorexia nervosa, Social media, Instagram, Survey, Italian-Düsseldorf Orthorexia Scale, Eating disorder, Diet.

Introduction

Orthorexia Nervosa (ON) is a type of eating disorder (ED). More specifically, it is an unspecified feeding and eating disorder¹. The term *orthorexia* comes from two Greek words: *orthos* (right) and *orexia* (hunger)². ON is characterized by an obsession with "healthy" eating patterns and adherence to a strict diet, based on "clean," "healthy," or "pure" foods³.

Recently, it has been defined as obsession, fixation, or concern with healthy food consumption⁴

that manifests in the form of rigid and compulsive eating, such as avoidance of foods considered "unhealthy" or "unclean"⁵, excessive worrying which could develop into a persistent and disturbing thought and stereotyped behavior⁴.

The origin of this condition is still unclear to date: neither the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5)⁶, nor the International Classification of Diseases 11th Revision (ICD-11) recognizes it as a diagnostic category as there is no consensus on the specific diagnostic criteria, although several have been proposed⁷.

At first glance, several typical symptoms of ON, such as the sense of frustration for the transgression of the dietary rules, overlap with those of other ED⁸. In addition, excessive concerns over food quality lead to restrictive food selection according to narrow criteria⁸. This affects the individual's capabilities to cope with the social, emotional, as well as economic environment, as there may be people who spend more resources than they can afford to get the food they consider healthy⁵.

Worldwide, the prevalence of ON ranges from as low as 6.9% to as high as 88.7%⁹. This wide range reflects the lack of unified criteria for diagnosis⁹ but may also indicate that some population groups are more prone to develop ON. A higher educational level has been associated with higher probability of ON¹⁰⁻¹³. In addition, specific groups show a tendency to orthorexic eating behavior due to their professional background (i.e., physicians, dietitians, artists, athletes)⁹.

The ON patient can be in normal-weight range¹⁴ or overweight¹⁵ or affected by obesity^{16,17}. Most studies¹⁸⁻²⁴ find no significant sex differences. Other studies¹²⁻¹⁵ suggest that the set of symp-

toms characteristic of the ON are more prevalent in women than in men, but that they are more frequent in men than in women. Furthermore, higher levels of ON have been reported in individuals who follow a vegan diet²⁴⁻²⁷ as it requires the elimination of many types of food (dairy products, meat, and other foods of animal origin) and the observance of strict nutritional rules, which are typical behaviors of ON²⁴.

The incidence of ON has increased in the recent years, the wide and rapid spread of health misinformation on various social media being a possible contributing factor²⁸. Social media is an increasingly popular tool for creating social connections and sharing life's moments²⁹. However, using social media may have negative effects on mental well-being²⁹. Although some social media communities, such as "healthy eating"²⁷, are meant to have a positive impact, they may play an active role in the development of eating disorders³⁰.

Instagram is a social platform launched in 2010. It is a photo-centric social network that allows users to share images and videos with other users they select (including celebrities), to describe images using hashtags (prefixed by the # symbol), to view what other users post, and be able to comment and show appreciation using a "like"²⁹. The #food hashtag ranks in the list of the 25 most popular hashtags on the platform. Excessive use of Instagram, a photo-sharing social network, has often been associated with high levels of depression³¹. Indeed, another popular hashtag on Instagram is #fitinspiration: a tag to inspire users to a healthier lifestyle, which instead displays and promotes very thin and well-toned female body shapes, possibly resulting in a negative effect on body image and self-esteem³². Several recent studies^{32,33} suggest that the COVID-19 pandemic and the related shelter-in-place policies had a considerable impact on the risk and symptoms of EDs. It is noteworthy that, during this period, the frequency of Instagram use has increased³².

Thus, we sought to analyze the association between social media networks and their use with ON in a convenience sample of social media users.

Subjects and Methods

Participants and Survey

We conducted an online survey from 26th to 28th of February 2022. The survey was developed by using Google Forms and was anony-

mous, according to Google's privacy policy³⁴. The survey was conducted in full agreement with the Declaration of Helsinki (2013) and with the international and national privacy rules, according to the General Data Protection Regulation (GDPR 679/2016). All participants were provided with full information about the survey and had to accept the privacy policy before taking part in the study. The survey was advertised on the Instagram by a physician expert in nutrition and involved in obesity stigma related research. The inclusion criteria were: age > 18 years and being able to answer independently.

Orthorexia Nervosa Assessment

The risk of ON was assessed using the validated Italian- Düsseldorf Orthorexia Scale (I-DOS)³⁵, the Italian version of the DOS, consisting of 10 items that assess orthorexic behaviors and attitudes on a four-point scale; starting from the highest score (4 points), indicating "this applies to me", to the lowest score (1 point), indicating "this does not apply to me". The questions are reported in a separate file: "**Supplementary File 1**". The maximum score is 40 points³⁶.

In addition to the I-DOS, participants were queried about sex, age, education level, marital status, weight and height to calculate BMI, main occupation. The metabolic diseases, the type of diet, the physical activity and the satisfactory body image were also investigated.

Social Media Use

To assess the association between social media and the risk of developing ON, the following questions were asked²⁹: "Which social network do you mainly use?" with a list of multiple response options: "Instagram", "Tik Tok", "Facebook", "Twitter", "LinkedIn", "Snapchat", "I don't use social networks"; "How often do you access this social network?" with multiple-choice answers of: "4-5 times a week", "2-3 times a week", "Once a day", "Several times a day"; "On a typical day when you access this social network, how much time do you spend there in total?" with multiple-choice answers of: "Less than 15 minutes", "15-30 minutes", "31-60 minutes", "60+ minutes"; "How often does the social media content that appears to you relate to food?"; "How often does the social media content that appears to you relate to high fashion images?"; "How often does the social media content that appears to you concern physical activities/gymnastics/ sports?"; "How often

does the social media content that appears to you concern diets and/or weight loss products?” Regarding the final four questions, participants could choose among: “Almost none or none”, “1 in 10”, “1 in 5”, “1 of 2”, “Almost all”.

Statistical Analysis

The sample size was based on the study of Turner and Lefevre²⁹. To find a correlation between the I-DOS score and the amount of time spent on social media channel with an r between 0.05 and 0.10, with 80% study power for an alpha one-tailed of 0.05, where at least 3,134 participants are required.

Continuous data were normally distributed and are reported as mean (SD). Categorical variables are reported as counts and (%). The unpaired *t*-test was performed to assess between-group differences. The χ^2 test was used to analyze the associations between categorical variables. Pearson’s correlation was performed to identify the variables correlated with I-DOS score (absolute value). The correlation between I-DOS score and the following variables was evaluated: age, sex, BMI, marital status, main occupation, type of working environment, type of social media, time spent on social network daily, and usual dietary pattern. Univariable linear regression was performed to assess the association between the I-DOS score and the variables assessed in the survey. Variables potentially associated with ON ($p < 0.1$) were included in a stepwise multivariable linear regression analysis. ANOVA was performed to compare the means between sex (male, female, and undeclared sex) with a Scheffé test as a post-hoc analysis. Significant differences were assumed to be present at $p < 0.05$ (two tailed). All comparisons were performed

using SPSS 25.0 for Windows (IBM Corp., Armonk, NY, USA).

Results

Demographic and Anthropometric Characteristics

A total of 4,111 individuals participated in the survey. Among them, 154 participants were men, 3,916 were women, and 37 did not declare their sex. Four questionnaires were not used because they were incomplete, bringing the total number of participants to 4,107. The demographic characteristics of the participants are reported in Table I. The mean age of the study population was 31 (± 9) years, with 95% of the sample being females. The prevalence of obesity was 14%. The mean I-DOS score was 30.6 (6). The prevalence of ON in our sample was 28.5% with a cut-off score ≥ 35 (see Table I).

The daily eating habits of the participants are shown in Figure 1. An omnivorous diet was followed by 71.4% of the respondents, a vegetarian diet by 17.5%, a vegan diet by 8.5%, and other type of diets by 2.6% (Figure 1).

Social Media Platforms Usage

As expected, Instagram was the most popular social media platform (Table II). The prevalence of ON among Instagram users was similar to that of the whole population (28.5%). More than half (52%) of the Instagram users reported seeing photos of food (1 to 5 times), and 38.5% of physical activities (1 to 5 times) (data not available). Of note, 50.2% of the Instagram users reported that they rarely searched for photos of dietary or weight loss products (data not shown).

Table I. Demographic characteristics of the participants.

Demographics	All participants (n= 4,107)
Age (yrs)	31 (± 9)
Sex, female (%)	95
Marital status, unmarried (n, %)	3,162, 77%
Main occupation, working (n, %)	2,711, 60%
Participant does not work in the field of nutrition, nor sports, nor as a physician (n, %)	3,655, 89%
Weight (kg)	66.7 (± 16)
BMI (kg/m ²)	24.4 (± 5)
Obesity (%)	575, 14%
I-DOS score	30.6 (± 6)
I-DOS score (≥ 35)	1,170, 28.5%

Data are mean (SD) or count and percentage. BMI = body mass index; I-DOS, Italian- Düsseldorf Orthorexia Scale.

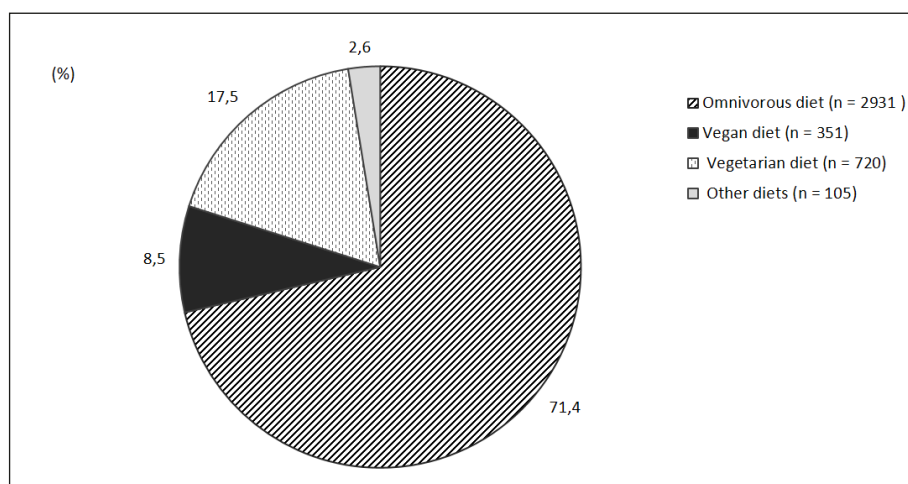


Figure 1. Eating habits of the participants.

The demographic and anthropometric characteristics of the Instagram and other social media users have been analyzed (**Supplementary Table I**). In comparison with the other social media users, the group of Instagram users was found to be younger and with a lower prevalence of obesity and metabolic diseases. (**Supplementary Table I**). The I-DOS score did not change across the groups ($p=0.23$; **Supplementary Table I**).

Predictors of I_DOS Score

The Pearson's correlation coefficient showed a positive relationship between the I-DOS score and the female gender ($r=-0.04$; $p=0.003$), BMI ($r=0.07$; $p<0.001$), main occupation – worker – ($r=-0.03$; $p=0.05$), type of job – the participant does neither work in nutrition, nor sport, nor as a physician – ($r=0.06$; $p=0.003$), time spent on social media channel per day ($r=0.06$; $p<0.001$), and omnivorous diet ($r=-0.10$; $p<0.001$). No relationship was found between I-DOS score and age ($r=0.01$; $p=0.24$), marital status ($r=-0.03$; $p=0.47$), or the type of social media used ($r=-0.01$; $p=0.21$).

Afterwards, a stepwise multivariable linear regression analysis has been performed. This analysis showed a correlation between I-DOS score and gender, BMI, working activity, average time spent on social media channel per day and daily diet (Table III).

Finally, the prevalence of respondents with symptoms suggestive of ON (I-DOS score ≥ 35) according to gender, obesity, ON, average time spent on social media per day and omnivorous diet was analyzed (**Supplementary Table II, III, IV** and Figure 2). The percentage of the respondents with ON was similar between sexes ($p=0.93$) and in participants with or without obesity ($p=0.057$) (**Supplementary Table II, III**). The prevalence of ON was higher among participants who reported a social media use of more than 60 minutes as compared to those reported to use social media for less than 15 minutes per day (31% vs. 21.8%, respectively; $p<0.001$) (Figure 2).

In addition, there was a significant difference in the prevalence of ON (I-DOS score ≥ 35) amongst different diets: the prevalence of ON was

Table II. Prevalence of social media usage, by % use of each channel, % daily visits, and average time spent on each channel.

Variables	Instagram	Tik Tok	Facebook	Twitter	LinkedIn	Snapchat	Did not use any social network
Using this channel (%)	93.2	1.1	3.5	1.8	0.3	0	0.1
Users visiting daily (%)	94.0	91.5	89.4	94.5	63.6	0.0	0
Time users spend on this channel per day over 60 minutes (%)	41.8	53.2	22.5	46.6	18.2	0	0

Data are mean (SD) or count and percentage. BMI = body mass index; I-DOS, Italian- Düsseldorf Orthorexia Scale.

Table III. Multivariable linear regression analysis – Factors associated with I-DOS score.

Dependent variable I-DOS score	B	SE	B	p	C.I. 95%	
					UL	LL
Gender	-11.7	0.59	-0.03	0.049	-2.2340	-0.004
BMI	0.10	0.01	0.10	<0.001	0.064	0.0140
Working activity	-0.44	0.12	-0.06	0.001	-0.695	-0.188
Time spent on social media channel per day	0.34	0.11	0.05	0.004	0.111	0.580
Omnivorous diet	-0.79	0.14	-0.10	<0.001	-1.088	-0.509

Excluded variables: main occupation; BMI = body mass index; CI = confidence interval; LL = lower limit; UL = upper limit.

30.3% in those adhering to an omnivorous diet, compared to 23.7% in those following a vegan/vegetarian diet and 20% in those on other diets ($p < 0.001$) (Figure 3).

Discussion

This study investigated the relationship between ON and social media usage in an Italian population sample. In our sample, the prevalence of ON was 28.5% and is similar to that reported by some^{15,37-39}, but not all authors. A lower prevalence (12.3%) was reported in a population of 446 university students, 70% of whom were women, analyzed in 2016, four years before the COVID-19 pandemic³⁵. The higher prevalence of ON in our study population compared to the abovementioned study might be a consequence of the COVID-19 shelter-in place policies⁴⁰. In fact, during the pandemic the use of social media, above

all Instagram, increased³². Furthermore, it can be hypothesized that these circumstances have led people to get more exposed to content focused on food, exercise, and fitness, hence to a potentially higher risk of developing ON. High proportions of individuals with symptoms suggestive of ON have been reported among athletes^{41,42}, vegans^{37,43}, or individuals employed in a certain work environment, such as dietitians or nutritionists^{14,44}. These are groups that must pay particular attention to nutrition for sport performance, ethical, or work-related reasons. A strength of our study is the use of the I-DOS questionnaire to assess the risk of ON. This scale is a valid and reliable instrument for measuring orthorexic behaviors and attitudes, thanks to its brevity and its good psychometric properties³⁵.

Most participants in our survey were female. In this respect, this research is analogous to a part of the existing literature^{10,45}. Health-promoting behaviors and healthy lifestyle patterns are gen-

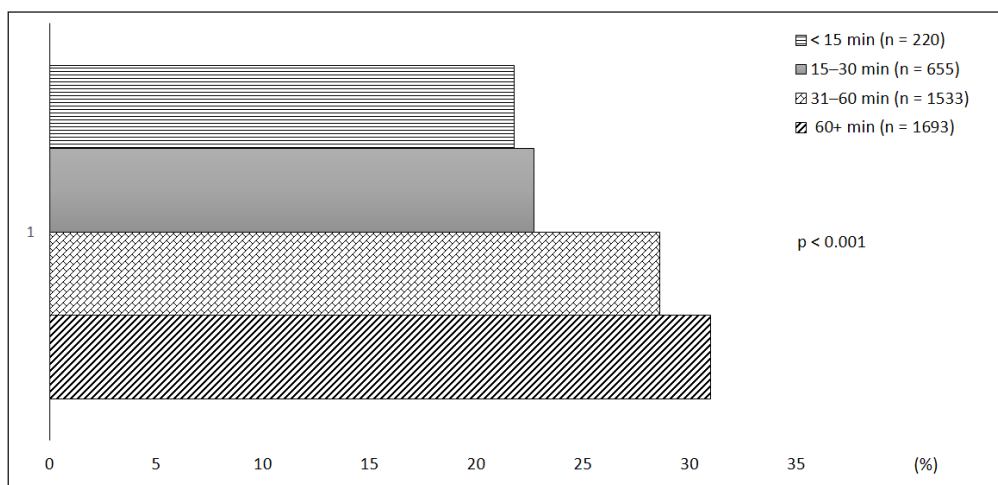


Figure 2. Prevalence of participants with an I-DOS score (≥ 35) according to the average daily time spent on social media.

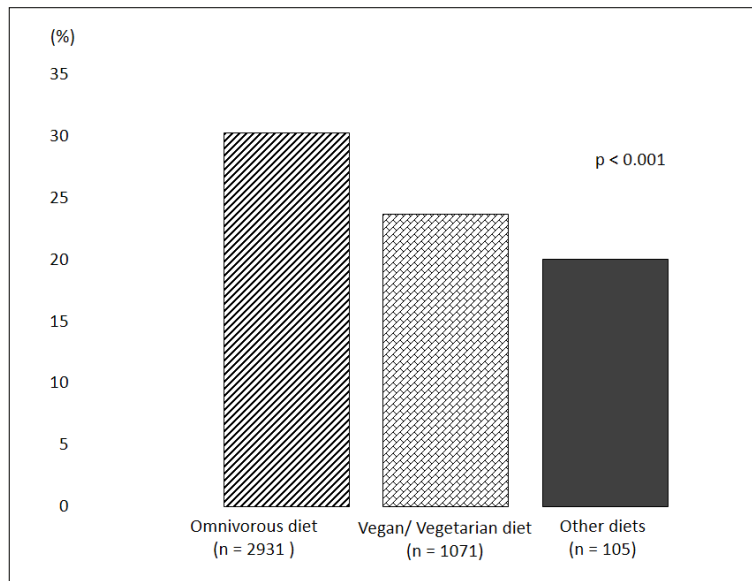


Figure 3. Prevalence of participants with ON (I-DOS score ≥ 35) according to usual dietary pattern.

erally more common in women, and this might explain the high proportion of women in our study. However, these attitudes may cause unhealthy eating behaviors such as ON because of women's greater susceptibility to nutrition/health programs spread by mass media²⁰. This increased sensitivity has been heightened in social media platforms, most notably Instagram²⁹. This may affect food selection, the strict control of weight, low-calorie diet, potentially leading to excessive attention and obsession with personal physical appearance²⁰. ON shares common features with EDs and obsessive-compulsive disorders, which are more frequent in women than in men⁴⁶⁻⁴⁹. This could be a further explanation of the high proportion of women in our study.

The proportion of individuals with a I-DOS score suggestive of ON was similar between individuals with or without obesity, although the difference was borderline significant. The characteristics of normal weight and overweight orthorexics according to some studies are: individuals belonging to young adult and adult age category, mostly female with a high level of education^{10,11,13,23,35,46,50}. They usually work in specific sectors, such as doctors, dieticians, or athletes^{14,15,41,42}.

In the study population, the omnivorous diet was the one most commonly followed by ON subjects, compared to the vegan/vegetarian diet. This finding is in contrast with previous studies²⁷ reporting that individuals following a vegan diet manifest higher levels of ON as this diet requires the exclusion of some major food groups (dairy products, meat and other foods of animal origin)

and complying with strict nutritional rules, which are typical behaviors of ON²⁴. The vegan/vegetarian orthorexics follow specific rules such as the elimination of foods of animal origin⁵¹, while omnivores orthorexics present higher levels of cognitive restriction⁵², and follow different rules in response to obsessive-compulsive behaviors.

Participants in our study were mostly Instagram users. There are several factors that might contribute to the high proportion of individuals with symptoms suggestive of ON among Instagram users²⁹. First of all, the photo-focused nature of the social network: pictures are easier to remember than words⁵³. Instagram encourages the selective exposure to a certain type of content produced by accounts which the users choose to follow. This exposure leads them to believe that a particular behavior is better, inducing them to imitate this behavior as a result of the perceived social media pressure²⁹. Thus, following accounts that promote exercises or healthy eating lifestyles is perceived to be a good role model to follow in order to improve their lives, without realizing that they may be slowly experiencing negative conditions, both psychological and physical. Secondly, there is a tendency among some Instagram users to regard users with a large number of followers as authorities. Consequently, they may freely influence their followers, including their nutrition habits²⁹. People, especially those with low self-esteem, appear to be much more vulnerable to developing EDs, because they are concerned about how they are perceived by others⁵⁴. Social media use may increase this tendency. These factors can

help explain why Instagram is the preferred social platform of the healthy eating community³⁰. According to this research data, the prevalence of ON based on Instagram usage is 28.5%²⁹. Therefore, the use of this social network could be a risk factor for the development of ON.

In support of this is our finding of the correlation between symptoms of ON and time spent on social media. The prevalence of ON was higher among participants who reported using social media for over 60 minutes per day as compared to those who used social media for less than 15 minutes per day (31% vs. 21.8%). Individuals who spend more time on social networks are more exposed to the same type of content (related to healthy eating), which lingers in their minds for much longer, prompting them to potentially emulate the content creators.

Limitations

This study focused on the relationship between social media usage and the prevalence of ON. We must acknowledge some limitations of the study, which may affect some outcomes. First of all, the selection of participants. The study population comprised Instagram users. As a consequence, the sample could be considered as self-selected, and the results should be interpreted by taking this fact into account. It is highly probable that the prevalence of ON is higher than in the general population, as the survey respondents had an interest in this topic. Furthermore, a population selected *via* web may have additional selection biases, as a consequence, the characteristics of the study population (sex, age, BMI, etc.) may be different from those of the general population and the findings cannot be generalized. Additional biases may be found in the self-reported data (weight, height, diet).

Conclusions

The results of this study suggest that longer time spent on Instagram is associated with increased risk of ON. Further research is needed to confirm these findings and to understand how to act in order to limit the potentially detrimental impact of social media usage on eating behaviors.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Funding

There was no funding for this study.

Informed Consent

All participants provided fully informed written consent at the time of recruitment.

Ethics Approval

The questionnaires are anonymous, in full compliance with the 2013 Declaration of Helsinki and with international and national privacy standards, according to the General Data Protection Regulation data (GDPR 679/2016).

Availability of Data and Materials

The data and material can be made available from the authors.

Authors' Contributions

M.G. Tarsitano and E. Giannetta planned the study. G. Proni, E. Mocini and F.R. Lenzi collected the data. A. Pujia and Y. Ferro did the analysis. M. G. Tarsitano, R. Pujia and E. Giannetta wrote the draft paper. All authors contributed to and approved the final version of the manuscript. ù

ORCID ID

Tarsitano Maria Grazia: 0000-0002-3500-0591.

References

- 1) Ward ZJ, Rodriguez P, Wright DR, Austin SB, Long MW. Estimation of Eating Disorders Prevalence by Age and Associations with Mortality in a Simulated Nationally Representative US Cohort. *JAMA Netw Open* 2019; 2: 1912925.
- 2) Bratman S. The health food eating disorder. *Yoga J* 1997; 42: 50-54.
- 3) Yilmaz MN, Dundar C. The relationship between orthorexia nervosa, anxiety, and self-esteem: a cross-sectional study in Turkish faculty members. *BMC Psychol* 2022; 10: 82-85.
- 4) Cena H, Barthels F, Cuzzolaro M, Bratman S, Brytek-Matera A, Dunn T, Varga M, Missbach B, Donini LM. Definition and diagnostic criteria for orthorexia nervosa: a narrative review of the literature. *Eat Weight Disord* 2019; 24: 209-246.
- 5) Bratman S, Knight D. *Health Food Junkies*. Broadway Books, New York, 2000.
- 6) Association AP. *Diagnostic and statistical manual of mental disorders (5th ed.)*, 2013.
- 7) Stochel M, Janas-Kozik M, Zejda J, Hyrnik J, Jelonek I, Siwiec A. Validation of ORTO-15 Questionnaire in the group of urban youth aged 15-21. *Psychiatr Pol* 2015; 49: 119-134.

- 8) Koven NS, Abry AW. The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat* 2015; 11: 385-394.
- 9) Niedzielski A, Kazmierczak-Wojtas N. Prevalence of Orthorexia Nervosa and Its Diagnostic Tools-A Literature Review. *Int J Environ Res Public Health* 2021; 18: 5488.
- 10) Arusoğlu G, Kabakçi E, Köksal G, Merdol TK. Orthorexia nervosa and adaptation of ORTO-11 into Turkish. *Turk Psikiyatri Derg* 2008; 19: 283-291.
- 11) Aksoydan E, Camci N. Prevalence of orthorexia nervosa among Turkish performance artists. *Eat Weight Disord* 2009; 14: 33-37.
- 12) 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: 151-157.
- 13) Barnes MA, Caltabiano ML. The interrelationship between orthorexia nervosa, perfectionism, body image and attachment style. *Eat Weight Disord* 2017; 22: 177-184.
- 14) Asil E, Surucuoglu MS. Orthorexia Nervosa in Turkish Dietitians. *Ecol Food Nutr* 2015; 54: 303-313.
- 15) Fidan T, Ertekin V, Işıkay S, Kirpınar I. Prevalence of orthorexia among medical students in Erzurum, Turkey. *Compr Psychiatry* 2010; 51: 49-54.
- 16) Oberle CD, Samaghabadi RO, Hughes EM. Orthorexia nervosa: Assessment and correlates with gender, BMI, and personality. *Appetite* 2017; 108: 303-310.
- 17) Dunn TM, Gibbs J, Whitney N, Starosta A. Prevalence of orthorexia nervosa is less than 1 %: data from a US sample. *Eat Weight Disord* 2017; 22: 185-192.
- 18) Ramacciotti CE, Perrone P, Coli E, Burgalassi A, Conversano C, Massimetti G, Dell'Osso L. Orthorexia nervosa in the general population: a preliminary screening using a self-administered questionnaire (ORTO-15). *Eat Weight Disord* 2011; 16: 127-130.
- 19) Håman L, Barker-Ruchti N, Patriksson G, Lindgren EC. Orthorexia nervosa: An integrative literature review of a lifestyle syndrome. *Int J Qual Stud Health Well-being* 2015; 10: 26799.
- 20) Bağcı Bosi AT, Camur D, Guler D. Prevalence of orthorexia nervosa in resident medical doctors in the faculty of medicine (Ankara, Turkey). *Appetite* 2007; 49: 661-667.
- 21) Brytek-Matera A, Donini LM, Krupa M, Poggiale E, Hay P. Orthorexia nervosa and self-attitudinal aspects of body image in female and male university students. *J Eat Disord* 2015; 3: 2-5.
- 22) Strahler J, Wachten H, Mueller-Alcazar A. Obsessive healthy eating and orthorexic eating tendencies in sport and exercise contexts: A systematic review and meta-analysis. *J Behav Addict* 2021; 10: 456-470.
- 23) Herranz Valera J, Acuña Ruiz P, Romero Valdespino B, Visioli F. Prevalence of orthorexia nervosa among ashtanga yoga practitioners: a pilot study. *Eat Weight Disord* 2014; 19: 469-472.
- 24) Barthels, F, Meyer F, Pietrowsky R. Orthorexic and restrained eating behaviour in vegans, vegetarians, and individuals on a diet. *Eat Weight Disord* 2018; 23: 159-166.
- 25) Heiss S, Coffino JA, Hormes JM. What does the ORTO-15 measure? Assessing the construct validity of a common orthorexia nervosa questionnaire in a meat avoiding sample. *Appetite* 2019; 135: 93-99.
- 26) Dittfeld A, Gwizdek K, Jagielski P, Brzęk J, Ziara K. A Study on the relationship between orthorexia and vegetarianism using the BOT (Bratman Test for Orthorexia). *Psychiatr Pol* 2017; 51: 1133-1144.
- 27) Kalika E, Egan H, Mantzios M. Exploring the role of mindful eating and self-compassion on eating behaviours and orthorexia in people following a vegan diet. *Eat Weight Disord* 2022; 27: 2641-2651.
- 28) Kalra S, Kapoor N, Jacob J. Orthorexia nervosa. *J Pak Med Assoc* 2020; 70: 1282-1284.
- 29) Turner PG, Lefevre CE. Instagram use is linked to increased symptoms of orthorexia nervosa. *Eat Weight Disord* 2017; 22: 277-284.
- 30) Marsh S, Clean CD. Eating trend can be dangerous for young people, experts warn. *Guardian*, 2016.
- 31) Tiggemann M, Zaccardo M. 'Strong is the new skinny': A content analysis of #fitspiration images on Instagram. *J Health Psychol* 2018; 23: 1003-1011.
- 32) Vall-Roque H, Andres A, Saldana C. The impact of COVID-19 lockdown on social network sites use, body image disturbances and self-esteem among adolescent and young women. *Prog Neuropsychopharmacol Biol Psychiatry* 2021; 110: 110293.
- 33) Di Renzo L, Gualtieri P, Cinelli G, Bigioni G, Soldati L, Attinà A, Bianco FF, Caparello G, Camodeca V, Carrano E, Ferraro S, Giannattasio S, Leggeri C, Rampello T, Lo Presti L, Tarsitano MG, De Lorenzo A. Psychological Aspects and Eating Habits during COVID-19 Home Confinement: Results of EHLC-COVID-19 Italian Online Survey. *Nutrients* 2020; 12: 2152.
- 34) Google Privacy and Terms. Available at: <https://policies.google.com/privacy?hl=en>.
- 35) Cerolini S, Vacca M, Zagaria A, Donini LM, Barbaranelli C, Lombardo C. Italian adaptation of the Dusseldorf Orthorexia Scale (I-DOS): psychometric properties and prevalence of orthorexia nervosa among an Italian sample. *Eat Weight Disord* 2022; 27: 1405-1413.
- 36) Barthels F, Pietrowsky R. Orthorectic eating behaviour - nosology and prevalence rates. *Psychother Psychosom Med Psychol* 2012; 62: 445-449.
- 37) Dell'Osso L, Abelli M, Carpita B, Massimetti G, Pini S, Rivetti L, Gorrasi F, Tognetti R, Ricca V, Carmassi C. Orthorexia nervosa in a sample of Italian university population. *Riv Psichiatri* 2016; 51: 190-196.
- 38) Moller S, Apputhurai P, Knowles SR. Confirmatory factor analyses of the ORTO 15-, 11- and 9-item scales and recommendations for suggested cut-off scores. *Eat Weight Disord* 2019; 24: 21-28.

- 39) Jerez TL, Valdés-Badilla P, Pacheco E, Pérez C. Prevalence of orthorexic behaviour in high school students of Temuco. *Rev Chil Nutr* 2015; 42: 41-44.
- 40) Yucel UO, Yucel M. Changes in diet, lifestyle, and Orthorexia Nervosa tendency during the COVID-19 pandemic: A web-based study. *Clin Nutr ESPEN* 2022; 49: 241-245.
- 41) Paludo AC, Magatão M, Martins HRF, Martins MVS, Kumstát M. Prevalence of Risk for Orthorexia in Athletes Using the ORTO-15 Questionnaire: A Systematic Mini-Review. *Front Psychol* 2022; 13: 856185.
- 42) Surąła O, Malczewska-Lenczowska J, Sadowska D, Grabowska I, Białecka-Dębek A. Traits of Orthorexia Nervosa and the Determinants of These Behaviors in Elite Athletes. *Nutrients* 2020; 12: 2683.
- 43) Dell'Osso L, Carpita B, Muti D, Cremone IM, Massimetti G, Diadema E, Gesi C, Carmassi C. Prevalence and characteristics of orthorexia nervosa in a sample of university students in Italy. *Eat Weight Disord* 2018; 23: 55-65.
- 44) Abdullah MA, Al Hourani HM, Alkhatib B. Prevalence of orthorexia nervosa among nutrition students and nutritionists: Pilot study. *Clin Nutr ESPEN* 2020; 40: 144-148.
- 45) Koven NS, Abry AW. The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat* 2015; 11: 385-394.
- 46) Keller MF. Orthorexia in young fitness participants. *Klinsk Sygpleje* 2013; 27: 63-71.
- 47) Hay P. Current approach to eating disorders: a clinical update. *Intern Med J* 2020; 50: 24-29.
- 48) Galmiche M, Déchelotte P, Lambert G, Tavolacci MP. Prevalence of eating disorders over the 2000-2018 period: a systematic literature review. *Am J Clin Nutr* 2019; 109: 1402-1413.
- 49) Richter PMA, Ramos RT. Obsessive-Compulsive Disorder. *Continuum Minneap Minn* 2018; 24: 828-844.
- 50) Dell'Osso L, Cremone IM, Chiarantini I, Arone A, Casagrande D, Massimetti G, Carmassi C, Carpita B. Investigating Orthorexia Nervosa With the ORTO-R in a Sample of University Students With or Without Subthreshold Autism Spectrum: Focus on Dietary Habits and Gender Differences. *Front Psychiatry* 2022; 13: 900880.
- 51) Ruby MB. Vegetarianism. A blossoming field of study. *Appetite* 2012; 58: 141-150.
- 52) Brytek-Matera A. Interaction between Vegetarian Versus Omnivorous Diet and Unhealthy Eating Patterns (Orthorexia Nervosa, Cognitive Restraint) and Body Mass Index in Adults. *Nutrients* 2020; 12: 646.
- 53) Childers TL, Houston MJ. Conditions for a picture-superiority effect on consumer memory. *Journal of consumer research* 1984; 11: 643-654.
- 54) Łucka I, Janikowska-Hołoweńko D, Domarecki P, Plenikowska-Ślusarz T, Domarecka M. Orthorexia nervosa – a separate clinical entity, a part of eating disorder spectrum or another manifestation of obsessive-compulsive disorder? *Psychiatr Pol* 2019; 53: 371-382.