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Orthorexia – current approach. A review

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Summary

The aim of the study was to define orthorexia nervosa (ON) based on the latest scientific findings regarding incidence, groups and risk factors as well as relationships between ON and other clinical entities. The paper is based on the review of the MEDLINE/PubMed databases. Publications published between 2009 and 2019 were analyzed in terms of epidemiology, risk factors and formulation of the ON concept. ON is a clinical entity of an unclear origin and various authors have continued their discussion on the relation between ON and other groups of disorders (AN, BN, OCD, ASD). Epidemiological data vary and depending on a population present extreme values from anywhere between 1% and 90%. Risk factors are alternatively identified in various groups and authors are not unanimous as for the effect of determinants such as anthropometric and sociodemographic variables on the presence of ON symptoms. Presented findings are affected by the fact that there is a relatively small number of studied groups, they are not fully representative and applied tools are different: BOT, ORTO-15, EHQ, DOS. Since the nosological status of ON remains unclear and there are no standard and operationalized diagnostic criteria and reliable assessment tools, ON requires further study. Similarly, because it is still not known how to best treat ON – which is caused by ambiguities in the concept of the phenomenon itself – prevention and therapy programs, which are non-existent, should be developed (in risk groups in particular).

Key words: orthorexia nervosa

Introduction

Orthorexia nervosa (ON), i.e., "pathological fixation on healthy nutrition" is a term first defined by S. Bratman in 1997. Since the first scientific study focusing on ON, when Donini et al. defined it as a "manic obsession" with healthy diet [1, 2], the origin of ON remains unclear, epidemiological data vary, risk factors are alternately

identified and its nosological status is not determined – it is not included in ICD-10, nor was it defined as a mental disorder in DSM-5 [3].

Undoubtedly, healthy nutrition habits play a protective role by reducing, e.g., the risk of illnesses resulting from the contact with harmful substances such as hormones or pesticides, and they are a common practice among individuals who have some knowledge on food and healthy eating [4]. In ON, excessive concerns and ideas about nutrition lead to a restrictive selection of food according to extremely tight criteria [5]. Restrictions, rituals and food stereotypes prevail in life, disturbing functioning in its most basic aspects [4]. In a compulsive attachment to implementing the idea of a healthy diet, individuals who suffer from ON often make irrational eating decisions. They lose control and the chance to change their behavior, and experience emotional, social and health consequences of their choices [6]. It is reflected both in the clinical practice and in the medical cases described in literature which illustrate the gravity of somatic consequences of ON, including a life-threatening state due to cachexia (BMI = 12.3 kg/m2) [2, 7].

So far, despite a continuously growing interest in ON and the number of scientific reports regarding ON, literature still remains limited and this paper is the first Polish study of the available literature.

Material and method

This paper is a review of texts published in the last 10 years (2009–2019; the last literature update: March 2019) obtained in electronic form via: MEDLINE/PubMed database and Cochrane Library. While browsing the papers to analyze, the following key words were used: "ortoreksja", "ortoreksja psychiczna", "zaburzenia odżywiania", "orthorexia", "orthorexia nervosa", "eating disorders". The key words were searched for in titles and/or abstracts. Initially, 660 results were shown using the above-presented phrases. As first, based on the title and a preliminary analysis of the abstract, it was investigated if the selected texts concerned the subject of the review. Next, abstracts were analyzed. Exclusion criteria included papers which concerned species other than human, were available in languages other than Polish and English as well as texts with substantial methodological errors. Additionally, conference materials and unpublished PhD theses were not included. Finally, full texts were analyzed and methodological errors constituted an additional exclusion criterion at this stage. Furthermore, analysis of references helped to include 3 more papers. Eventually, the analysis included 19 research studies. The selection process in presented in Figure 1.

Discussion. Definition — an update

Mental disorders are characterized by changeability in time and incidence as well as a varied clinical picture. Some phenomena become diagnoses, while others cease to be identified as disorders [8]. The discussion in the area of ON status is not unanimous. Segura-Garzia et al. [4] postulate that ON does not only refer to pro-health choices and therefore the term ON should be applied only in the context of describing clinical

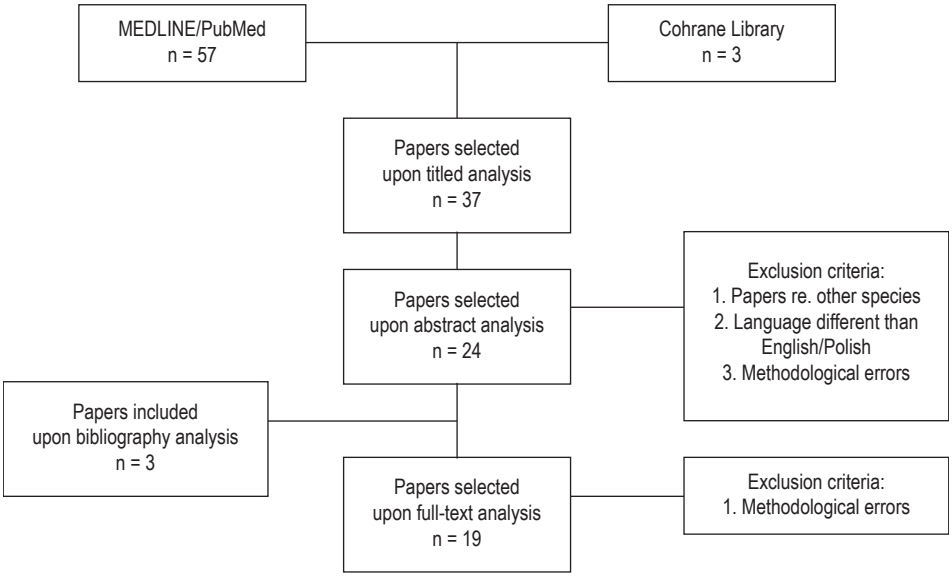

Figure 1. **A chart presenting the process of selection of papers for the review**

conditions. Due to the lack of currently operative diagnostic criteria according to ICD-10 and DSM-5, Moroze et al. [7] have undertaken to establish them. They describe ON in the perspective of paying an excessive attention to the quality and ingredients of food accompanied by disturbances in social functioning resulting from extreme concentration on healthy food. Furthermore, the disorder does not result from a presence of other illnesses, including mental conditions, nor religious reasons or dietary recommendations related to medical state [2, 7, 9, 10]. The aforementioned criteria were revised by Dunn and Bratman [2] who indicated a necessary secondary-to-diet presence of medical symptoms resulting from malnutrition and body mass loss as well as conflicts with others regarding dietary choices resulting from ON [2, 11, 12]. The above definition is the latest attempt to frame ON in a diagnostic context.

A review of applied research methods for orthorexia nervosa

The oldest tool to assess ON symptoms is the BOT (*Bratman Orthorexia Test*), applied in one of the first studies on the prevalence of ON [13]. The questionnaire was created on the basis of a list of 10 questions regarding ON symptoms which was included in Bratman's critical paper of 2000 [13–15]. The tool was seen by the author himself more as a quiz. Until now, the BOT is applied in research studies both worldwide [16] and in Poland [17].

The ORTO-15 questionnaire developed by Donini et al. is the most frequently used tool to assess severity of ON symptoms. In 15 questions, it refers to cognitive, emotional and clinical aspects [3]. The score in the questionnaire ranges from 15 to

60. The assessment tool uses the > or = 40 criterion to suggest the presence of ON [5, 18–22], together with the cut-off point equaling 35 [3, 4, 6, 9, 12, 19, 23–27]. On the basis of studies which incorporated the ORTO-15 in the Turkish version it was possible to obtain data on prevalence of ON in various groups, e.g., medicine students (45.5%) [5] or artists (56.4%), including opera singers (81.8%), orchestra musicians (36.4%) and ballet dancers (32.1%) [28]. Also, the Portuguese version of the ORTP-15 [20] was used, and the validation of the tool into the Polish conditions was carried out by the team led by Janas-Kozik et al. [3].

Research studies apply a number of modified versions of the ORTO-15. There is the 11-item Turkish version ORTO-11 adapted by Arusoğlu et al. [29], used in the study of Fidan et al. [30] on a relatively young group (21=/-2.1) of medicine students in which the incidence was estimated to be 43.6%. Recently, this version was applied by Karakus et al. [31] among 208 students specializing in nutrition and dietetics. The authors do not estimate the incidence of ON, however, they observe that males are predisposed to ON whereas BMI, dieting or using supplements do not constitute risk factors. Validation of the Spanish version – ORTO-11-ES on a group of 492 individuals was carried out by Parra-Fernandez et al. [10]. In a Hungarian group consisting of 810 individuals aged 20–70 (mean age 32.39 +/ – 10.37 years), Varga et al. [32] used the ORTP-11-HU version and estimated the prevalence of ON to be 74.2% in the studied group. There is also a 9-item Polish version – ORTHO-PL adapted by Brytek-Matera [33], which was recently presented as the ORTO-15 [34]. Another variation is the Austrian ORTO-GE, which helped to establish that ON is present in 69.1% in an age-diverse group of 1,029 individuals aged 19–70 (mean age 31.21 +/ – 10.43 years) [35].

The EHQ (*Eating Habits Questionnaire*) was created by Gleaves et al. and comprises of 21 items referring to "normal eating behaviors", "problems associated with healthy eating" and "a positive attitude towards healthy food" [36]. In a study on 459 students of psychology, the American authors did not observe any significant differences in terms of sex as far as general number of ON symptoms is concerned. However, they observed that men present orthorexic behavior more often than women (MANOVA M ¼ 20.07; SE ¼ 0.62 vs. M ¼ 18.39; SE ¼ 0.29) while women outnumber men in terms of positive emotions towards healthy food (MANOVA M ¼ 9.20; SE ¼ 0.11 vs. M ¼ 8.67; SE ¼ 0.24). The authors also postulate that persons suffering from ON are characterized by a high level of narcissism and perfectionism [36], which corresponds with superiority tendencies present among orthorexia patients together with the feeling of pride resulting from the ability to implement the idea of healthy and perfect diet.

The DOS questionnaire (*Düsseldorf Orthorexia Scale*) developed by Barthels et al. is a 10-item tool related to the "Orthorexic eating behaviors", "avoiding additional substances" and "using dietary supplements". The score of the questionnaire ranges from 10 to 40 and the results of > or = 30 indicate ON, while the scores of 25–29 suggest alarming food-related behavior [37, 38]. The study of He et al. [39] on 1,075 Chinese individuals shows that 7.8% of the studied subjects manifest ON symptoms (10.6% of males and 5.3% of females).

Research studies on prevalence, groups and risk factors of orthorexia nervosa

Data regarding prevalence of ON vary significantly, similarly to its risk factors, the scope of which is also heterogeneous. ON incidence in the general population is estimated to range from 6.9% to 57.6% [1, 8, 19]. In groups believed to be particularly vulnerable, these values go up to almost 90% [40], e.g., among people who practice ashtanga yoga it is 86% [21]. A clear tendency to ON is also observed among sportsmen [23] as well as in a community of people associated with healthcare, dieticians, students specializing in nutrition or physical activities [26].

A high prevalence of ON among dieticians was confirmed in one of the first studies on ON. In a group of 283 individuals it was 12.8%, while 34.9% of the studied subjects manifested some orthorexic behaviors [13, 40, 41]. In the same professional group ($n = 392$), Alvarenga et al. [20] observed as much as 81.9% of ON cases. On the other hand, Bo et al. [42] observed ON in 25.9% of Italian students of dietetics and physical education, and high prevalence values can be observed in both university specializations (35.9% and 22.5%, respectively). Additionally, they concluded that dieticians are two times more predisposed to eating disorders (ED), while physical education students – to bigorexia (a 10-fold increase in risk). According to the above study, applying a diet and supplements is a risk factor for ON, ED and bigorexia [42]. Other researchers have not observed any increased tendency to ON among students specializing in nutrition [11, 35]. Furthermore, Tremelling et al. [40] observed that almost a half of the studied group manifested ON symptoms (49.5%), ($n = 636$; 615 females, 21 males). The American authors also noted co-existing ED in 12.9% of participants, while 8.2% confirmed that they had previously been treated (usually due to AN). The obtained findings led the researchers to a conclusion that for individuals suffering from ON, apart from a healthy eating model and an obsession with control, the issues around the appearance and body weight are also significant [40]. Grammatikopoulou et al. [16] estimated that among 176 students of nutrition and dietetics, 68.2% manifested ON symptoms. The latest reports in the form of corresponding results allow to believe that students of dietetics are burdened with a high risk of ON.

Various authors point to a more frequent incidence with ON among persons who are on a diet, including vegan and vegetarian diets [11, 35]. Recently, Dell'Osso et al. [25] who investigated Italian students observed that ON was present in 34.9% of cases and vegan or vegetarian diet constituted a risk factor for ON. In these groups, ON symptoms were significantly more frequent than in individuals who prefer traditional diet (56.2% vs. 32.2%) or with low BMI, as compared to the group with average or high values of nutrition level (42.8% vs. 34.2%). The authors suggested that due to the similarity between ON and AN, ON should be considered as a phenotype of AN [25]. A Polish team also confirmed statistically significantly more frequent presence of ON symptoms in vegetarians (30.5%) than in a non-vegetarian group (26.4%; $p = 0.01$; $n = 2{,}611$). In the aforementioned study, an increase of ON tendency is observed to be inversely proportional to age and the length of dieting (Spearman's $R = – 0.26$; $p < 0.001$) – younger persons who are vegetarian for a short period of time are more predisposed to ON [17]. The described studies suggest that especially young persons

who implement alternative nutrition models are in the group of a significant risk of developing abnormal behaviors related to food and, as a result, ON.

According to the first American study by Dunn et al. [11] on a group of 275 students, the ON risk is estimated to be 10% and its actual incidence equals less than 1%, which constitutes the lowest value so far. A recently published Australian study shows that the sex of the studied subjects has no effect on ON (220 participants aged 17–62, mean age 23.82 +/ – 8.40). However, the authors observed a relationship between ON and a high level of perfectionism, focus on the appearance and preoccupation with weight and a low satisfaction with one's body. Furthermore, in the ON risk group there were persons with insecure attachment patterns (anxious and avoidant), which are common in AN and BN. On this basis, the authors suggested framing ON in a perspective of eating disorders spectrum [43]. Similarly, Varga et al. did not observe any effect of sex, BMI, sports or diet as risk factors for ON [32]. However, in a group of relatively young students of diversified faculties (mean age 22.78 ± 3.33), Parra-Fernandez et al. [10] observed the incidence of ON at 17%, but females (19.3%) statistically outnumbered males (11.9%) ($Chi^2 = 4.03$; $p = 0.04$).

As it was mentioned above, the presence of ON symptoms is often observed in various risk groups. It should also be noted that conducted studies usually cover groups of students. While observing a group of 456 students, Depa et al. [37] reported that ON was present only in 3.3%, and 9% of the population was in a risk group. As for risk factors, the authors identified younger age (18–20 years) of students (5.9%); they also observed a prevalence of males (3.7%) over females (2.8%) among studied subjects with ON. Similar data were obtained by Strahler et al. [38] in a group of 713 students (mean age 29.4 ± 11.2 years) where ON prevalence was 3.8%. Furthermore, Sanlier et al. [22] observed ON in 59.8% of the studied population, and its prevalence did not depend on major of studies (ON symptoms were present in students of social science, mathematics, nutrition, nursing, and physiotherapy. However, they observed a 2.5-fold higher risk of ON in females (logIS = 2.49; 95%PU:1.88–3.30; $p < 0.001$) than males. Contrary findings were obtained by Malmborg et al. [26] in a studied population ($n = 188$) where the incidence of ON was 76.6%. In this study, the ON tendency depended on the major of studies and was clearer in a group of students of majors related to physical activity, health and nutrition than in students of economy (84.5% vs. 65.4%; $p = 0.002$). While applying a reduced cut-off point in the ORTO-15, which is 35, a supremacy of males over females can be observed in terms of a tendency to ON (34.6% vs. 20.6%; $Chi^2 = 4.63$; $p = 0.031$) [26]. The aforementioned research studies exemplify considerable changeability and diversity of results not only while estimating ON prevalence in various populations, but also a discrepancy in identifying ON risk factors. The summary of findings of the studies discussed so far is presented in Table 1.

Table 1. **Studies identifying prevalence, group and risk factors of ON**

Study name	Research tools	What was assessed	Studied group	Results	Remarks
Karakus et al. [31] 2017	ORTO-11	Risk of ON among students of dietetics and nutrition; effect of sociodemographic variables on the risk of ON	208 subjects	Male sex as a risk factor for ON, no effect of BMI, diet, supplements on the risk of ON	Cross-sectional study
Oberle et al. [36] 2017	EHQ, SES, NPI, MPS	Effect of sex, BMI and personality factors on symptoms of ON	459 subjects	No effect of sex on general number of ON symptoms. A high level of BMI in males as a risk factor for ON. Significant relation between ON and narcissism and perfectionism	Cross-sectional study
Tremelling et al. [40] 2017	ORTO-15, EDE-Q	Prevalence of ON and ED among dieticians; relation between ON symptoms and ED symptoms	363 subjects	High prevalence of ON and a risk of ED in dieticians. A clear relation between ON and ED	Cross-sectional study
Grammatikopoulou et al. [16] 2018	BOT, EADES, mYFAS	Prevalence of ON, food-dependence, stress-eating among students of nutrition and dietetics; eating habits	176 subjects	High prevalence of ON in student of dietetics and nutrition	Cross-sectional study
Dell'Osso et al. [25] 2018	ORTO-15, Sociodemographic and nutrition data questionnaire	Prevalence of ON, effect of sex and eating habits on symptoms of ON	2,130 subjects	High prevalence of ON in a studied population. Type of a diet, female sex, low BMI as risk factors for ON	Population study
Dittfeld et al. [17] 2017	BOT, personal and anthropometric questionnaire	Frequency of ON symptoms in vegetarians and non-vegetarians	2,611 subjects	High prevalence of ON in vegetarians	Cross-sectional study
Barnes et al. [43] 2017	ORTO-15, MPS, MBSRQ-AS, RSQ, RSES, demographic data and past ED therapy questionnaire	Risk factors for ON	220 subjects	Perfectionism, focus on appearance, preoccupation with weight, dissatisfaction with one's body and insecure attachment style are risk factors for ON	Cohort study

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Parra-Fernandez et al. [10] 2018	ORTO-11-ES, EDI-2 Sociodemographic questionnaire	Prevalence of ON, analogies between ON and ED.	454 subjects	High prevalence of ON, female sex as risk factors for ON	Cross-sectional study
Depa et al. [37] 2017	DOS	Prevalence of ON, risk factors for ON, effect of age, sex and knowledge about nutrition on symptoms of ON.	446 subjects	Low prevalence of ON, male sex, younger age as risk factors for ON	Cross-sectional study
Strahler et al. [38] 2018	DOS, WHO-5, WREQ, PHQ-9, AUDIT, Y-BOCS, MEDAS, GPPAQ, anthropometric and sociodemographic data questionnaire	Prevalence of ON, relationship between ON and other mental disorders	713 subjects	Low prevalence of ON, ON as a sub-clinical form of ED.	Cross-sectional study
Sanlier et al. [22] 2016	ORTO-15, EAT-40, sociodemographic data and eating habits questionnaire	Prevalence of ON and ED, effect of sex and BMI on symptoms of ON.	900 subjects	High prevalence of ON and risk of ED, female sex as a risk factor for ON, no effect of BMI and studied major on symptoms of ON	Cross-sectional study
Malmborg et al. [26] 2017	ORTO-15, SF-36, IPAQ	Prevalence of ON, effect of health condition and physical activity on symptoms of ON	188 subjects	High prevalence of ON; students of faculties related to physical activity, health and nutrition in the group of ON risk, male sex as a risk factor for ON. No effect of health condition on the risk of ED	Cross-sectional study

Research studies on ON prevalence in clinical groups

ON leads to wrong eating choices which are dictated by the urge to avoid contact with contaminated or otherwise impure food. However, the aim – in a form of improving health or avoiding illness – is not obtained and the outcomes of decisions and ritualized behaviors seriously impede normal functioning. The nature of ON symptoms has always inspired researchers to search for a relation between ON and classic forms of eating disorders (AN and BN).

The first longitudinal study in a clinical group revealed that ON frequently (28%) co-exists with ED (AN and BN) and ON symptoms develop almost twice more often

(58%) once therapy is completed. On this basis the authors postulate that ON may be a less threatening, descending form of eating disorders [4]. Another study in a group of 52 females with ED with a majority of BD patients (77%) and 23% of AN patients was presented by Brytek-Matera et al. The authors observed a very high ON prevalence in this group – 82.7% [34]. Furthermore, Gramaglia et al. [44] included in their study 58 patients with a confirmed diagnosis and in the course of a therapy due to AN from Italy (n = 23) and from Poland (n = 35). The presence of symptoms in the Polish AN group (85.5%) was statistically significantly more frequent that in the Italian group (60.9%) (Chi^2 p = 0.031), which, in the authors' opinion, resulted from inter-cultural differences in the approach to the idea of healthy eating. The obtained results may also have resulted from methodological limitations of the tool ORTO-15 itself.

The aforementioned studies indicate that there is a high comorbidity between ON and AN. It should be mentioned that ON and AN share the symptoms of losing pleasure in eating and the need of control [4], but also restricted appearance, a feeling of guilt for departure from a diet and ego-syntonic nature of the symptoms [45]. In both cases, there is an increased level of anxiety and perfectionism [30, 43]. The main difference lays in a qualitative attitude to nutrition in ON, while in AN a quantitative attitude prevails [8]. Moreover, in AN and BN body image and the idea of a perfect silhouette matter the most, and what matters in ON is a need of pure food [3, 4]. A person suffering from AN strives for thinness with no excessive care about the body, while a person with ON, by implementing unrealistic images about food, aims at health improvement [4]. The summary of the studies' result is presented in Table 2.

Table 2. **Studies identifying prevalence of ON in clinical groups**

Study name	Research tools	What was assessed	Studied group	Results	Remarks
Segura–Garzia et al. [4] 2015	ORTO-15, YBC-EDS, Eat-26	Prevalence of ON among females with AN and BN	32 patients with ED and 32 healthy females (control group)	High prevalence of ON among females with AN and BN	Experimental study
Brytek–Matera et al.[34] 2015	ORTO-15, EAT-26, MDBSRQ	Similarities and differences between ON and ED among females with AN and BN	52 patients with ED	High prevalence of ON among females with AN and BN	Descriptive study
Gramaglia et al. [44] 2017	ORTO-15	Similarities between ON and AN among females with z AN and healthy ones	58 patients with AN and 78 healthy females (control group)	High prevalence of ON among females with AN	Clinical control study

As far as research reports on clinical groups are concerned, literature is scarce, although there are attempts to conceptualize ON throughout its relationships with other

clinical phenomena. There are common features between ON and OCD, which are reflected in intrusive thoughts about food, ritualized behavior and focus on impurity of food products [45]. What differentiates the two disorders is mainly ego-dystonic nature of symptoms. Strahler et al. [38] have recently paid attention to the behavioral nature of ON symptoms. According to Dell'Osso et al. [46], there is a similarity between ON and ASD expressed in: (1) obsessiveness and rigidity in food-related activities; (2) social isolation resulting from a superior attitude and no tolerance towards others; and (3) unchangeability and repeatability of behavior, which eventually impairs functioning. Moreover, what should be taken into consideration is a possibly psychotic nature of ON symptoms, which are understood as prodromal symptoms of delusional character and food-related content [45].

Studies on prevalence and risk factors of ON in Poland

Atypical, eating disorders-related behaviors – including bigorexia, diabulimia, alcorexia or pregorexia [46] – are becoming more and more often described in the literature [42]. Polish authors also present ON from the perspective of a new, non-specific form of eating disorders [47]. Relatively recently, Polish research findings have also been presented. The first paper on the assessment of ON prevalence among adolescents in Poland (13.7%) was published in 2016 [6]. High prevalence of ON (27%) among school teenagers is reported by Łucka et al. [27] who point to the highest risk of ON among adolescents aged 13–16 years [9]. In the studies which incorporate the ORTO-15 validated by the team of Janas-Kozik, the authors did not observe any effect of the sociodemographic factor on the prevalence of ON; however, they did report a 5-fold higher risk of ON in the group with ED (Log IS 5.40; $p < 0.001$), framing ON within the eating disorders spectrum [9]. Yet in another study, in the group of 120 Polish students (36.1% of the subjects below 20 years of age) the prevalence of ON was 28.3%, where a higher frequency of ON symptoms was manifested by students of health-related majors. According to the authors, persons suffering from ON did not experience body image dissatisfaction and there was also no correlation between BMI value and ON symptoms, which suggest no relationship between ON and AN [12]. Despite contrary conclusions regarding a relation between ON and AN, the aforementioned studies present convergent findings in obtained high values of ON prevalence in studied populations. Additionally, they point to a considerable risk of ON in the group of Polish teenagers and young adolescents. A summary of the findings of the above-described studies is presented in Table 3.

Table 3. **Studies identifying prevalence and risk factors of orthorexia in Poland**

Study name	Research tools	What was assessed	Studied group	Results	Remarks
Łucka et al. [27] 2018	ORTO-15, EAT-26, MOCI, BDI-II, interview questionnaire	Prevalence and risk factors of ON	864 subjects	High prevalence of ON, high BMI, younger age, type of school (junior high-school) as risk factors for ON. No effect of sex or sociodemographic characteristics on prevalence of ON	Descriptive study
Łucka et al. [9] 2018	ORTO-15, EAT-26, MOCI, interview questionnaire	Prevalence of ON; a relation between ON and ED, OCD	864 subjects	High prevalence of ON, high risk of ON among individuals with ED, high BMI level as a risk factor for ON, sociodemographic characteristics with no effect on ON prevalence	Descriptive study
Plichta et al. [12] 2019	ORTO-15, BPPPS, FFQ-6	Prevalence of ON, eating habits, satisfaction with one's body	1,120 subjects	High prevalence of ON, students of health-related majors in the risk group of ON, BMI has no effect on symptoms of ON	Descriptive study

Orthorexia on the Web or in the web of orthorexia?

Recently, a steady growth of social media popularity can be observed. 90% of individuals aged between 16 and 34 years use them in Great Britain, and Instagram itself is used by more than a half of people aged 18–29 in the USA [24]. Dickinson et al. [48] present evidence that implementing eating choices presented by nutrition bloggers would bring minimal health benefits. The first study of ON in the context of social media was carried out by Turner and Lefevre. The group consisted of 680 females whose age ranged from 18 to 75 years (mean age 27.70 +/ – 7.87 years), out of whom 44.6% were British, 26.7% lived in the USA and the remaining 40 in other countries. The authors observed one of the highest-so-far values of ON prevalence (90.6%) among the Instagram users in a healthy-nutrition community. The time spent on this site is a significant risk factor for ON symptoms ($\beta = -0.12$, $p = 0.003$) [24]. A summary of findings of the studies on orthorexia in the context of new media is presented in Table 4.

Table 4. **Studies on orthorexia vs. social media**

Study name	Research tools	What was assessed	Studied group	Results
Turner and Lefevre [24] 2017	ORTO-15, questionnaire of habits re. Internet use and eating habits	Prevalence of ON among social media users	680 subjects	High prevalence of ON, social media users as a risk group for ON

Abnormal nutrition models may lead to a reduction of recommended amount of physical activity and to obesity [50]. On the other hand, nowadays it is easy to find scientifically-unverified information or dangerous-to-life suggestions about nutritious restrictions, including the elimination of a variety of products [49]. In 2011, Vandereycken described ON as an issue present in practice and awareness of clinicians, out of whom 67% (n = 111) confirmed that they had a contact with individuals suffering from ON [10, 45]. The time period between 19 and 24 years of age plays a key role in shaping beliefs and eating habits [10], since those which originated in adolescence and early adulthood quite often persist until we die [50]. Furthermore, adolescence is characterized by a high risk of ED development [10], also in forms other than AN and BN. According to Le Grange et al., their prevalence is 80.98% among American adolescents [47]. As mentioned before, in this paper current literature confirms the presence of ON also among adolescents, although data are still relatively scarce.

To conclude, ON eventually leads to emaciation and malnutrition, which is reflected in a change of the outlook on its diagnostic criteria. It may be assumed that unhealthy and often unjustified beliefs affect various choices, including those related to health and nutrition. Taking into consideration the cultural changes, continuously increasing progress and a range of new technologies together with results of numerous studies presented in this paper, the authors tend to conclude that professionals should remain sensitive to the issues related to ON in the perspective of mental health of adolescents and young adults in particular.

Conclusions

The number of reports regarding ON has been growing in recent years. Authors are not unanimous in postulating that ON should be an independent clinical entity, proving its affinity with the eating disorders spectrum or underlining behavioral nature of ON symptoms. It is suggested that ON should be identified from the perspective of a clinical condition which is responsible for disturbing the biopsychosocial balance of an individual. There are studies on the psychometric properties of new and previously-available diagnostic tools. Recently, the circle of researchers studying ON has been broadening with authors across the globe, including Poland, and incoming papers widen the scope of scientific knowledge about ON, which so far has been shaped mainly by the achievements of Europeans. Since the nosological status of ON remains unclear, there are no uniform and operationalized diagnostic criteria or reliable assessment tools, ON requires further study. Similarly, prevention programs

must be developed (in risk groups in particular), together with still non-existing therapeutic programs. The reason they are not in place results from the lack of concept of how to treat ON which in turn is caused by uncertainties in framing the concept of the phenomena itself.

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