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THE PREVALENCE AND SELECTED RISK FACTORS OF ORTHOREXIA NERVOSA DISORDER USING THE ORTO-15 TEST

Summary

Background. Although the phenomenon of orthorexia is widespread, its prevalence is hard to estimate. The aim of the study was to attempt to determine the occurrence of orthorexia in the study group and to assess the associations between selected risk factors and the prevalence of orthorexia. The survey was conducted in April 2023 among students of the Faculty of Health Sciences of the Academy of Applied Sciences in Nowy Sącz and via social media. A diagnostic survey method was employed using a questionnaire technique developed by the authors and the ORTO-15 questionnaire. Two cut-off points of < 40 and < 35 points were used. The Mann-Whitney U test, the Chi-Square test of independence and Cronbach's alpha were carried out to analyse the results.

Results and conclusions. The prevalence of *orthorexia nervosa* for a cut-off point of < 40 points was estimated at 77.78 %. Lowering the cut-off point to < 35 points resulted in a decrease in the prevalence of orthorexia in the study group to 24.69 %. For a cut-off point of < 40 points, a statistically significant relationship was obtained between the presence of orthorexia and the presence of chronic diseases. For a cut-off point of < 35 points, statistically significant relationships were obtained between the prevalence of orthorexia and BMI and between the presence of orthorexia and complaints. The other factors were not significantly different for any of the assumed cut-off points. Based on the results, the authors emphasize the need for further research on the use and creation of the useful adaptation of the ORTO-15 test in determining the prevalence and risk factors of orthorexia.

Key words: *orthorexia nervosa*, ORTO-15 test, BMI, medical education, chronic diseases

Introduction

Orthorexia nervosa is an eating disorder involving obsessive, strict adherence to a self-imposed healthy diet, paradoxically leading to multidimensional negative psycho-

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physiological effects [1, 9, 10, 13, 16, 20, 22, 29]. It has not yet been recognized as a distinct disease entity in the ICD-10/ICD-11 and DSM-5 classifications, but is the subject of increasing research fields of psychology, psychiatry and medicine [13].

The pathological behavior of people affected by orthorexia focuses on the aspect of nutrition, including the detailed analysis of the composition of products consumed and the gradual elimination of those which may raise an affected person's doubts about their potentially negative impact on health. Planning the type, composition and handling of meals becomes the overriding goal each day, and the rejection of more and more products from the menu on the grounds that they are harmful can lead to serious health consequences, including malnutrition and secondary diseases resulting from nutritional deficiencies [7, 10, 19, 20, 21, 22, 28].

Available scientific reports have increasingly focused on this recently described disorder [20], but research findings on orthorexia are inconclusive. The lack of a standardized tool with high reliability and diagnostic accuracy is highlighted. The screening test that is mostly used is the ORTO-15 test, which has seen many modifications, both in terms of questions it takes from the original version and the interpretation of scores. It has been claimed that this test overdiagnoses the phenomenon, which has led to calls for an urgent need to modify this tool because of epidemiological data showing increasing numbers of cases of orthorexia [3, 12, 13, 16, 19, 20, 22, 23, 28, 29].

The factors that are related to the development of this disorder are also discussed, and those particularly often described include: age, gender, BMI, educational profile (especially medical professions including dietitians) [1, 2, 7, 10, 13, 16, 18, 20, 21, 25, 27, 28, 29, 20, 21, 22, 23, 27, 28, 29, 30], and recent reports particularly emphasize the potential importance of chronic diseases and complaints requiring diet therapy, while also pointing out the paucity of data in this aspect [11, 17, 26]. Research findings on potential risk factors are highly divergent and one reason for this problem is attributed to the inadequacies of the ORTO-15 test [3, 7, 9, 19, 20, 21, 22, 23].

The ORTO-15 test, the most popular and internationally used screening test to diagnose orthorexia, was used in the present study. In the literature, it has been critically discussed by many authors in terms of its repeatedly presented lack of internal consistency and poor psychometric design, having ambiguous and differently interpreted wording by respondents, and the problem of a possibly inappropriate cut-off point of indicating orthorexia resulting in overdiagnosis of the phenomenon [1, 3, 7, 9, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 25, 26, 29]. However, none of the less popular tools used to date, such as the EHQ eating habits questionnaire, the Dusseldorf Orthorexia Scale – DOS and others, provides a more suitable alternative due to similar limitations recognized by their authors or other researchers [1]. As the phenomenon of orthorexia appears to be increasing [3, 22], due to the pressing need for a reliable tool for the medical assessment and verification of this disorder, the ORTO-15 test has motivated

groups of researchers internationally to modify the number and type of questions included in it, as well as cut-off points used, in response to the psychometric values of the test obtained during analyses [3, 12, 13, 16, 19, 22, 23, 28].

The aim of the study was to attempt to estimate the prevalence of orthorexia and identify associations between selected risk factors, i.e. the degree and profile of education, gender, age, BMI, complaints, chronic diseases and the presence of orthorexia, using the ORTO-15 test at cut-off levels of < 40 and < 35 points.

The following hypotheses were formulated:

- H1: The prevalence of orthorexia is significantly associated with having a medical degree, studying in this field.
- H2: The prevalence of orthorexia is significantly associated with the level of education.
- H3: The prevalence of orthorexia is significantly associated with presenting a selected sociodemographic characteristic, i.e. age, gender.
- H4: The prevalence of orthorexia is significantly associated with BMI value.
- H5: Having chronic diseases or somatic complaints is significantly associated with the presence of orthorexia.

Material and methods

The study group consisted of students and staff of the Faculty of Health Sciences at the Academy of Applied Sciences in Nowy Sącz and volunteers recruited via social media. Interested persons were directed to a questionnaire, which they were asked to complete if they met the inclusion criteria. The inclusion criteria included adult students over 18 years of age. Respondents gave informed and voluntary consent to participate in the survey. They also confirmed that they were familiar with the risk factors associated with participation in the CAWI survey.

A diagnostic survey method based on a questionnaire developed by the authors and the standardized ORTO-15 questionnaire were used to conduct the study [25].

The authors' questionnaire attempted to characterize the general population participating in the study and included questions concerning age, gender, height, weight, the subjective perception of appearance based on body weight, an educational level and profile, occupational status, the field of study, being diagnosed with chronic diseases and experiencing complaints. A BMI was calculated based on height and weight. Given these details, study participants were classified into the following groups: < 18.50 underweight, 18.50-24.99 normal, 25.00-29.99 overweight, ≥ 30.00 obese [31].

The ORTO-15 test is a tool consisting of 15 questions respondents are to answer using a 4-point scale: always, often, sometimes, never. Responses indicating the risk of orthorectic behavior score 1 point, while healthy behavior scores 4 points. The maximum possible number of points to be obtained is 60. A cut-off point of < 40 points is

most often taken as the cut-off point. However, there are reports of a cut-off point set at < 45 , < 35 or < 33 points [4, 5, 6, 12, 15, 17, 18, 19, 22]. For diagnosing orthorexia, in addition to the < 40 points cut-off point suggested by the first authors [14], the most common cut-off point is < 35 points. It is a kind of consensus compared to other suggested extreme values [4, 5, 6, 12, 15, 17, 18, 19, 22]. This cut-off point was also used in our study. The Cronbach's alpha obtained for the full 15-item question scale was assessed by the authors of the current study as acceptable (0.72).

An analysis of the results was performed using the programs: Statistica 13.3 (Tibco, Krakow, Poland) and the Microsoft Excel 365. For all analyses, significance was set at $p \leq 0.05$. The Mann-Whitney U Test was used to compare means for more than two independent groups. The chi-square test with Yates correction was used to determine the effect of age, gender, BMI, educational level and profile on the frequency of responses to individual questions. To assess the reliability of the test, Cronbach's alpha was calculated. A result of $\alpha = 0.72$ was obtained, indicating that the test is reliable.

Results and discussion

The size of the study group was 405 people, including 348 women (85.93 %) and 57 men (14.07 %). Four age groups were identified during the study: 18-25, 26-35, 36-45 and ≥ 46 years old. The age breakdown of the respondents, in view of each age group, is shown in Figure 1.

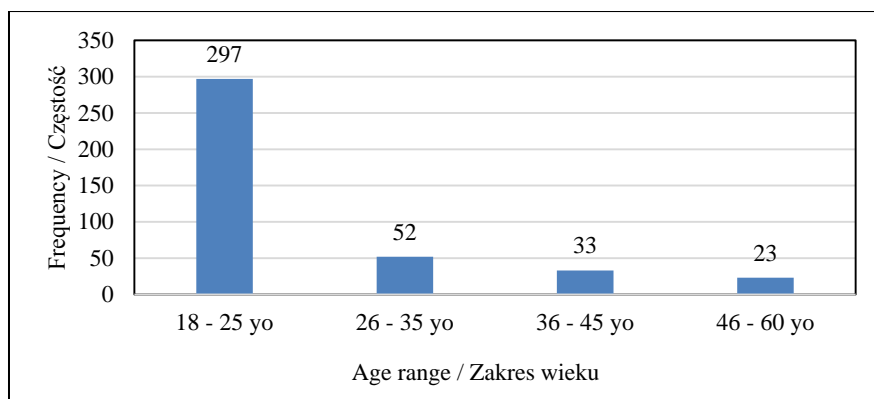


Fig. 1. Age groups of respondents

Rys. 1. Przynależność osób badanych do poszczególnych grup wiekowych

The mean BMI in the study group was $23.28 \pm 4.05 \text{ kg/m}^2$ (Table 1). There were 203 subjects (50.15 %) who declared that they had a university degree, 202 subjects (49.88 %) had secondary or vocational education level. Of 174 people working, 110 (63.22 %) were in the medical profession, 64 (36.78 %) had non-medical education. A

total of 231 students took part in the survey – 139 students (60.17 %) from medical faculties and 92 students (39.83 %) from non-medical faculties.

Chronic diseases were declared by 101 respondents (24.94 %), with 109 people (26.91 %) reporting they experienced a variety of medical conditions.

Table 1. Characteristics of the study group by BMI

Tabela 1. Charakterystyka badanej grupy z podziałem na BMI

BMI value / Wartość BMI	Interpretation / Interpretacja	Frequency / Częstość
≤ 18.49	Underweight / Niedowaga	25 (6.17 %)
18.50 – 24.99	Standard / Standard	270 (66.67 %)
25.00 – 29.99	Overweight / Nadwaga	79 (19.51 %)
≥ 30.00	Obesity / Otyłość	31 (7.65 %)
Total / Razem		405

Analysis of ORTO-15 test results

The average ORTO-15 test score for the entire study group was 36.70 ± 3.50 points. A detailed breakdown of individual scores is shown in Figure 2. The prevalence of orthorectic tendencies at a cut-off point of < 40 points was 77.78 % (315 subjects). For a cut-off point of < 35 points, orthorectic tendencies were demonstrated by 24.69 % (100 people). As many as 50 % of the respondents were in the scoring range of 35-39 points (Q1 and Q3) (Figure 2). The large discrepancy in the occurrence of orthorectic tendencies for the cut off points adopted is due to the breakdown of the number of points obtained in the ORTO-15 test in the study group.

The analysis of the relationship between selected anthropometric factors and the occurrence of orthorectic tendencies showed no statistical significance at a cut-off point of < 40 points for any of the factors analyzed. There was also no statistically significant relationship between age and gender and the presence of orthorectic tendencies at a cut-off point of < 35 points. The result of the chi-square test indicated a significant relationship ($p = 0.02$) between a BMI and the occurrence of orthorectic tendencies in the study group at a cut-off point of 35 points. It should be noticed that the subjects with a BMI value within the normal range had lower mean scores in the ORTO-15 test compared to those with a BMI value outside the normal range (36.50 vs. 37.07 points). As identified by the number of scores in the ORTO-15 test, the percentage of subjects with orthorectic tendencies was higher in the group of subjects with a BMI within the normal range than in the group of those with a BMI outside the normal range (28.15 % vs. 17.78 %) (Table 2).

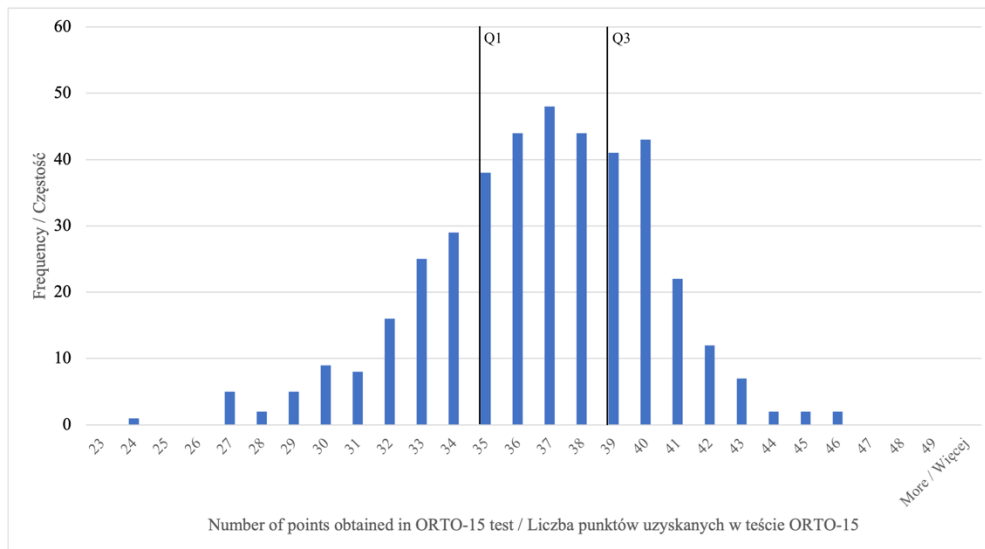


Fig. 2. Breakdown of results obtained in the ORTO-15 test in the whole study population

Rys. 2. Rozkład wyników uzyskanych w teście ORTO-15 w całej populacji badanej

Neither the degree or profile of education, nor the profile of studies in the study conducted are statistically significant predictors of the development of orthorexia, as confirmed at both analyzed cut-off levels (Table 3). To deepen the analysis, a relationship between an educational profile and the frequency of responses to individual questions was determined (Table 4, Table 5). A comparison of responses to individual questions given by people with and without orthorexia broken down by educational profile was performed using the Mann-Whitney U test (Table 6, Table 7). Given the fact that the analysis carried out in this study was extensive, only statistically significant responses were obtained from the respondents' answers due to having or not having an orthorectic disorder.

A statistically significant relationship was found, with an assumed cut-off point of < 40 points, between the presence of chronic diseases such as diabetes, hypertension, hypothyroidism, endometriosis, PCOS, ulcerative colitis and others, and the risk of developing orthorexia ($p = 0.04$). Mean scores obtained in the ORTO-15 test were higher in the group of subjects who were not diagnosed with chronic diseases compared to the group of subjects being diagnosed with comorbidities (37.04 vs. 35.61 points). The percentage of subjects with orthorectic tendencies was, in turn, 85.15 % in those with chronic conditions and 75.33 % in those without additional conditions. This relationship was not confirmed with a cut-off point set at < 35 points (Table 8).

Table 2. Selected demographic factors and the prevalence of orthorexia
Tabela 2. Wybrane czynniki demograficzne a występowanie tendencji ortorektycznych

Variable / Zmienna	Average ORTO-15 test score (points) / Średni wynik testu ORTO-15 (pkt)	Standard deviation / Odchylenie standardowe	Orthorectic tendencies (< 40 points) (<i>n</i>) / Tendencje ortorektyczne (< 40 punk- tów) (<i>n</i>)	No orthorectic tendencies (< 40 points) (<i>n</i>) / Brak tendencji ortorektycznych (< 40 punktów) (<i>n</i>)	Chi- square / Chi- kwadrat	p-Value / p-Value	Orthorectic tendencies (< 35 points) (<i>n</i>) / Tendencje ortorektyczne (< 35 punk- tów) (<i>n</i>)	No orthorectic tendencies (< 35 points) (<i>n</i>) / Brak tendencji ortorektycznych (< 35 punktów) (<i>n</i>)	Chi- square / Chi- kwadrat	p-Value / p-Value
Age / Wiek										
≤ 25 yo / ≤ 25 lat	36.70	3.50	230	67	0.07	0.79	71	226	0.37	0.54
> 25 yo / > 25 lat	36.67	3.57	85	23			29	79		
Gender / Płeć										
Female / Kobieta	36.61	3.47	275	73	2.22	0.14	88	260	0.47	0.49
Male / Mężczyzna	37.14	3.78	40	17			12	45		
BMI / BMI										
Standard / Norma	36.50	3.57	213	57	0.58	0.45	76	194	5.21	0.02
Outside the norm / Poza normą	37.07	3.39	102	33			24	111		

Table 3. Educational level and profile vs prevalence of orthorectic tendencies

Tabela 3. Poziom i profil wykształcenia a występowanie tendencji ortorektycznych

Variable / Zmienna	Average ORTO- 15 test score (points) / Średni wynik testu ORTO- 15 (pkt)	Standard deviation / Odchylenie standardowe	Orthorectic tendencies (< 40 points) (n) / Tendencje ortorektyczne (< 40 punk- tów) (n)	No orthorectic tendencies (< 40 points) (n) / Brak tendencji ortorektycznych (< 40 punktów) (n)	Chi- square / Chi- kwadrat	p-Value / p-Value	Orthorectic tendencies (< 35 points) (n) / Tendencje ortorektyczne (< 35 punk- tów) (n)	No orthorectic tendencies (< 35 points) (n) / Brak tendencji ortorektycznych (< 35 punktów) (n)	Chi- square / Chi- kwadrat	p-Value / p-Value
Education level / Wykształcenie										
Higher / Wyższe	36.70	3.69	159	44	0.07	0.79	46	157	0.90	0.34
Secondary / Średnie	36.67	3.33	156	46			54	148		
Education profile / Profil wykształcenia										
Medical / Medyczny	36.74	3.53	83	27	0.41	0.52	24	86	0.06	0.80
Non-medical / Niemedyczny	36.92	3.62	51	13			15	49		
Field of study / Profil studiów										
Medical / Medyczny	36.72	3.29	106	33	0.90	0.34	34	105	0.68	0.41
Non-medical / Niemedyczny	36.41	3.79	75	17			27	65		

Table 4. Educational profile vs frequency of responses to individual questions. Cut-off point < 40 points, questions with statistically significant answers

Tabela 4. Profil wykształcenia a częstość udzielania odpowiedzi na poszczególne pytania. Punkt odcięcia < 40 pkt, pytania zawierające odpowiedzi istotne statystycznie

	% answers / % wskazań				p*
	always / zawsze	often / często	sometimes / czasem	never / nigdy	
4. Are your eating choices driven by your worries about your health status? / 4. Czy wybierasz produkty spożywcze kierując się troską o swoje zdrowie?					
Orthorexia / Ortoreksja					
medical / medyczny	10.60	32.70	14.40	2.20	0.03
non-medical / niemedyczny	6.10	25.60	8.30	0.00	
No orthorexia / Brak ortoreksji					
medical / medyczny	1.10	15.60	42.20	7.80	0.59
non-medical / niemedyczny	0.00	11.10	17.80	4.40	
8. Do you allow yourself to break any eating rules you adhere to? / 8. Czy pozwalasz sobie na łamanie wyznawanych zasad dotyczących odżywiania?					
Orthorexia / Ortoreksja					
medical / medyczny	0.00	20.80	34.90	4.20	0.02
non-medical / niemedyczny	1.60	11.20	24.70	2.60	
No orthorexia / Brak ortoreksji					
medical / medyczny	3.30	35.60	24.40	3.30	0.33
non-medical / niemedyczny	2.20	14.40	11.10	5.60	
12. Do you think that eating healthy food may improve your appearance? / 12. Czy uważasz, że spożywanie zdrowej żywności może poprawić Twój wygląd?					
Orthorexia / Ortoreksja					
medical / medyczny	28.50	22.10	8.00	1.30	0.00
non-medical / niemedyczny	24.40	14.40	1.30	0.00	
No orthorexia / Brak ortoreksji					
medical / medyczny	17.80	28.90	16.70	3.30	0.19
non-medical / niemedyczny	5.60	14.40	13.30	0.00	

* χ^2

Table 5. Educational profile vs frequency of responses to individual questions. Cut-off point < 35 points, questions with statistically significant answers

Tabela 5. Profil wykształcenia a częstość udzielania odpowiedzi na poszczególne pytania. Punkt odcięcia < 35 pkt, pytania zawierające odpowiedzi istotne statystycznie

	% answers / % wskazań				p*
	always / zawsze	often / często	sometimes / czasem	never / nigdy	
8. Do you allow yourself to break any eating rules you adhere to? / 8. Czy pozwalasz sobie na łamanie wyznawanych zasad dotyczących odżywiania?					
Orthorexia / Ortoreksja					
medical / medyczny	0.00	18.40	35.70	2.00	0.02
non-medical / niemedyczny	2.00	5.10	33.70	3.10	
No orthorexia / Brak ortoreksji					
medical / medyczny	1.00	26.00	31.60	4.60	0.46
non-medical / niemedyczny	1.60	14.10	17.80	3.30	
12. Do you think that eating healthy food may improve your appearance? / 12. Czy uważasz, że spożywanie zdrowej żywności może poprawić Twój wygląd?					
Orthorexia / Ortoreksja					
medical / medyczny	40.80	13.30	2.00	0.00	0.31
non-medical / niemedyczny	33.70	10.20	0.00	0.00	
No orthorexia / Brak ortoreksji					
medical / medyczny	21.40	27.00	12.50	2.30	0.03
non-medical / niemedyczny	15.80	15.80	5.30	0.00	
14. Do you think that there is unhealthy food on the market? / 14. Czy sądzisz, że na rynku dostępne są niezdrowe produkty żywnościowe?					
Orthorexia / Ortoreksja					
medical / medyczny	44.90	6.10	5.10	0.00	0.02
non-medical / niemedyczny	33.70	10.20	0.00	0.00	
No orthorexia / Brak ortoreksji					
medical / medyczny	31.90	23.70	7.60	0.00	0.02
non-medical / niemedyczny	17.80	13.20	5.30	0.70	

* χ^2

The presence of medical complaints such as abdominal pain, headaches, joint pain, gastrointestinal complaints, fatigue, lethargy and others is not a statistically significant risk factor for the development of orthorexia with a cut-off point of < 40 points. Lowering the cut-off point to < 35 points results in the demonstration of a relationship between orthorectic tendencies and the analyzed factor ($p = 0.02$). The re-

spondents who did not declare the presence of any medical complaints had higher mean scores in the ORTO-15 test than those reporting complaints (37.07 vs. 36.50 points). In the group without complaints, the percentage of orthorectic tendencies was 21.62 %. Among subjects reporting complaints, it was significantly higher, standing at 32.73 % (Table 8).

Due to the fact that it was difficult to isolate factors showing a statistically significant relationship with the presence of orthorectic tendencies and the high percentage of diagnosed orthorectic tendencies with a cut-off point of < 40 points, the authors undertook an analysis of the usefulness of the ORTO-15 test as a tool for diagnosing orthorexia at the level of individual questions. The internal consistency of the ORTO-15 test was established using Cronbach's alpha at 0.72 (acceptable). A descriptive analysis of the values obtained for individual questions was carried out. The questions that showed a mean score of more than 2.67 points were considered behaviors representing a risk of developing orthorexia (Table 9). The 'risk' statements identified during the analysis were as follows: excessive concentration on meal preparation, the influence of mood on food choices and emotions experienced when eating meals that break the dietary rules.

Orthorexia nervosa, as an eating disorder that is not fully understood, arouses a great deal of controversy, from its actual prevalence to the nosological concepts inherent in its classification, to the screening tools themselves used to identify it. The present study, despite its attempt to estimate the prevalence of the phenomenon, as well as selected risk factors for its occurrence, is another example of discrepancy in data obtained from results of individual studies.

In the current study, among a sample of 405 respondents randomly presenting to the general population, the prevalence of orthorexia was 77.78 % and 24.69 % respectively (for the cut-off points of < 40 and < 35 adopted). Similar discrepancies in the prevalence of orthorexia are observed for many other studies, ranging from 0 % [26] to even around 97 %, depending on the group being studied [1, 2, 3, 6, 7, 9, 13, 14, 15, 16, 18, 19, 20, 23, 24, 25, 26, 27, 28, 29]. The most frequently identified risk groups in which the aforementioned values appeared to be the highest were, paradoxically, dietitians and those studying this field of study (in one study, in a group of Brazilian dietetic students, up to 88.7 % of individuals obtained ORTO-15 test result allowing the diagnosis of orthorexia [1, 15, 19, 23]); the people who choose vegetarian or vegan diet [22]; the people who are athletes [21] and attend the gym [13]; those who use Instagram/Twitter (in a British study, orthorexia was present among 49 % of 680 social media users following accounts about healthy eating [27]); customers of organic shops (in an Italian study, 69.4 % and 23.1 % for the ORTO-15 test cut-off scores of < 40 and < 35 , respectively, among 121 individuals [29]);, medical and nursing students (in

Table 6. Comparison of responses to individual questions given by people with and without orthorexia broken down by educational profile. Cut-off < 40 points, questions with statistically significant answers

Tabela 6. Porównanie odpowiedzi na poszczególne pytania osób z ortoreksją i bez ortoreksji w podziale na profil wykształcenia. Punkt odcięcia < 40 pkt, pytania zawierające odpowiedzi istotne statystycznie

Questions/ Pytania	orthorexia / ortoreksja			no orthorexia / brak ortoreksji		
	medical / medyczny	non-medical / niemedyczny		medical / medyczny	non-medical / niemedyczny	
	average / średnia	average / średnia	p*	average / średnia	average / średnia	p*
2. When you go in a food shop do you feel confused? / 2. Czy czujesz się zdezorientowany/-na w sklepie spożywczym?	1.67	1.83	0.05	1.87	1.83	1.00
12. Do you think that eating healthy food may improve your appearance? / 12. Czy uważasz, że spożywanie zdrowej żywności może poprawić Twój wygląd?	1.70	1.42	0.00	2.08	2.23	0.31
14. Do you think that on the market there is also unhealthy food? / 14. Czy sądzisz, że na rynku dostępne są niezdrowe produkty żywnościowe?	1.52	1.46	0.50	1.62	2.00	0.03
15. At present, are you alone when having meals? / 15. Czy obecnie spożywasz posiłki w samotności?	2.67	2.52	0.04	2.75	2.77	0.99

* UMW

Table 7. Comparison of responses to individual questions given by people with and without orthorexia broken down by educational profile. Cut-off < 35 points, questions with statistically significant answers

Tabela 7. Porównanie odpowiedzi na poszczególne pytania osób z ortoreksją i bez ortoreksji w podziale na profil wykształcenia. Punkt odcięcia < 35 pkt, pytania zawierające odpowiedzi istotne statystycznie

Questions/ Pytania	orthorexia / ortoreksja			no orthorexia / brak ortoreksji		
	medical / medyczny	non-medical / niemedyczny		medical / medyczny	non-medical / niemedyczny	
	average / średnia	average / średnia	p*	average / średnia	average / średnia	p*
12. Do you think that eating healthy food may improve your appearance? / 12. Czy uważasz, że spożywanie zdrowej żywności może poprawić Twój wygląd?	1.56	1.28	0.59	1.63	1.85	0.04

* UMW

Table 8. Chronic diseases and medical complaints and the presence of orthorexia

Tabela 8. Choroby przewlekłe i dolegliwości chorobowe a występowanie tendencji ortorektycznych

Variable / Zmienna	Average ORTO-15 test score (points) / Średni wynik testu ORTO-15 (pkt)	Standard deviation / Odchylenie standardowe	Orthorectic tendencies (< 40 points) (n) / Tendencje ortorektyczne (< 40 pkt) (n)	No orthorectic tendencies (< 40 points) (n) / Brak ten- dencji ortorektycznych (< 40 pkt) (n)	Chi- square / Chi- kwadrat	p-Value / p-Value	Orthorectic tendencies (< 35 points) (n) / Tendencje ortorektyczne (< 35 pkt) (n)	No orthorectic tendencies (< 35 points) (n) / Brak ten- dencji ortorektycznych (< 35 pkt) (n)	Chi- square / Chi- kwadrat	p-Value / p-Value
Chronic diseases / Choroby przewlekłe										
Yes / Tak	35.61	3.67	86	15	4.23	0.04	31	70	2.61	0.11
No / Nie	37.04	3.39	229	75			69	235		
Complaints / Dolegliwości chorobowe										
Yes / Tak	35.89	3.64	91	18	2.81	0.09	36	73	5.57	0.02
No / Nie	36.98	3.42	224	72			64	232		

* UMW

Table 9. Descriptive statistics of scores obtained from each question of the ORTO-15 test

Tabela 9. Statystyka opisowa wartości punktowych uzyskiwanych w poszczególnych pytaniach kwestionariusza ORTO-15

	Average / Średnia	Median / Mediana	Mode / Moda	Q1 / Q1	Q3 / Q3	Standard deviation / Odchylenie standardowe
1. When eating, do you pay attention to calorific value of food? / 1. Czy zwracasz uwagę na wartość kaloryczną spożywanych produktów żywnościowych?	2.89	3.00	3.00	2.00	4.00	1.02
2. Do you feel confused when you go to a grocery store? / 2. Czy czujesz się dezorientowany/-na w sklepie spożywczym?	1.76	2.00	1.00	1.00	2.00	0.82
3. Have you thought very often about food over the past three months? / 3. Czy przez ostatnie 3 miesiące szczególnie często myślałeś o jedzeniu?	2.67	3.00	3.00	2.00	3.00	0.86
4. Are your eating choices driven by your worries about your health status? / 4. Czy wybierasz produkty spożywcze kierując się troską o swoje zdrowie?	2.27	2.00	2.00	2.00	3.00	0.74
5. Is the taste of food more important than its quality when you evaluate food? / 5. Czy podczas oceny jedzenia smak jest dla Ciebie ważniejszy niż jego jakość?	2.59	3.00	Multi.	2.00	3.00	0.74
6. Are you willing to spend more money to have healthier food? / 6. Czy jesteś skłonny/-a wydać więcej pieniędzy, aby nabyć zdrowsze jedzenie?	2.37	2.00	2.00	2.00	3.00	0.74
7. Does thinking about food worry you for more than three hours a day? / Czy myślenie o jedzeniu trapi Cię przez więcej niż 3 godziny dziennie?	3.26	3.00	4.00	3.00	4.00	0.86

8. Do you allow yourself to break any eating rules you adhere to? / 8. Czy pozwalasz sobie na łamanie wyznawanych zasad dotyczących odżywiania?	2.34	2.00	2.0	2.00	3.00	0.65
9. Do you think your mood affects your eating behavior? / 9. Czy uważasz, że aktualny nastrój ma wpływ na Twoje zachowania żywieniowe?	2.78	3.00	3.00	2.00	3.00	0.79
10. Do you think that the conviction that eating only healthy food increases your self-esteem? / 10. Czy uważasz, że przekonanie o zdrowym odżywianiu zwiększa Twoją samoocenę?	2.52	2.00	2.00	2.00	3.00	0.90
11. Do you think that eating healthy food changes your lifestyle (frequency of eating in a restaurant, at your friends' home...)? / 11. Czy sądzisz, że zdrowe odżywianie wpływa na Twój styl życia (częstotliwość wyjść do restauracji, do przyjaciół ...)?	2.61	3.00	2.00	2.00	3.00	0.95
12. Do you think that consuming healthy food may improve your appearance? / 12. Czy uważasz, że spożywanie zdrowej żywności może poprawić Twój wygląd?	1.71	2.00	1.00	1.00	2.00	0.77
13. Do you feel guilty when you break eating rules you adhere to? / 13. Czy przeżywasz poczucie winy, gdy dokonujesz odstępstw od wyznaczonych zasad odżywiania?	2.75	3.00	3.00	2.00	4.00	1.08
14. Do you think that there is unhealthy food on the market? / 14. Czy sądzisz, że na rynku dostępne są niezdrowe produkty żywnościowe?	1.55	1.00	1.00	1.00	2.00	0.71
15. At present, are you alone when you have meals? / 15. Czy obecnie spożywasz posiłki w samotności?	2.64	3.00	3.00	2.00	3.00	0.69
TOTAL / SUMA	36.71	37.00	37.00	35.00	39.00	3.52

a Turkish study, 62.2 % of 969 medical and nursing students showed orthorectic tendencies [30]); opera (81.8 %) and symphony musicians (36.4%), ballet dancers (32.1%) [16]; and among dietary supplement users [16].

Studies on risk factors for orthorexia conducted to date attempted to estimate the prevalence of this disorder considering sociodemographic data, but the result obtained presented further discrepancies. There is no consensus on the prevalence of this phenomenon in relation to gender of the subject presented: while some reports link orthorexia to the female gender [10, 14], others point to the male gender [1, 15, 16] and others to the lack of gender differences in a predisposition to orthorectic behavior [2, 13, 28]. The present study also does not confirm an association between the gender and the frequency of orthorexia diagnosis, regardless of the cut-off point used in the ORTO-15 test.

A possible link between age and orthorectic disorders has also been of interest to researchers. In the literature, one can find a relatively large number of studies dedicated especially to young people, including students [1, 2, 3, 6, 7, 10, 13, 14, 15, 16, 20, 24, 25]. Age, especially younger age [16], as a factor associated with orthorectic tendencies, is confirmed, for example, by a Hungarian study on a group of 810 participants, where a modified, 11-item version of the ORTO-15 test (ORTO-11-Hu) was used [28], but other studies deny a link between age and orthorexia [4, 27]. In this aspect, a study of 743 Polish and 519 Lebanese adults found no significant correlation between age and orthorexia [4]. This factor was also analyzed in the current study, where the criterion of young age (less than 25 years old, mostly characterizing university age) did not reach statistical significance as a predisposing element for orthorexia. The considerations of potential risk factors for this disorder logically also attempt to link the BMI (Body Mass Index) of the subjects as a reflection of problems with maintaining an appropriate body weight and thus seeking and following an appropriate, sometimes restrictive diet [1, 4, 10, 14, 16, 17, 18, 27]. These are examples of further discrepancies: while some reports confirm a significant association of presented overweight [14, 18] or underweight [8] with orthorexia, reports demonstrating the absence of such a relationship can also be found [16, 27]. For example, a multicenter study involving several hundred Italian, Polish and Spanish students found that a higher body mass index was significantly associated with the risk of orthorexia [14]. A study among Italian students at the University of Pisa confirmed that orthorexia symptoms were more frequently observed among those with a low body mass index compared to those with a normal or high body mass index [8]. The present study highlighted the association of diagnosed orthorexia with a BMI considered only in terms of normal and non-normal (underweight and overweight or obese individuals), where a significant relationship was found between these factors at the cut-off point of 35 points ($p = 0.02$) in the ORTO-15 test used (no significant relationship was found at the cut-off point for

< 40 points). Attention must be given to the fact that it was the respondents with a BMI value within the normal range who had lower mean scores in the ORTO-15 test compared to those with a BMI value outside the normal range (36.50 vs. 37.07 points).

An interesting aspect of many ongoing studies seems to be the attention paid to the educational background of those predisposed to orthorectic disorders, where medical professions, both in the category of professional practice and stage of study, are considered an important risk factor [1, 6, 13, 15, 16, 20, 24]. The current study presented here does not confirm the association between both having such an educational profile and working in a medical profession and studying such fields of study (i.e. nursing, paramedicine, dietetics, midwifery, medicine) and a higher prevalence of orthorexia compared to in the general population. The lack of significant differences between an educational profile in the medical/non-medical categories is also confirmed by another study analyzing 77 health facilities, suggesting a link between orthorexia and specific personality predispositions rather than an educational type [5]. Many studies focus on the prevalence of orthorexia in groups presenting a specific type of education, particularly often among dietitians and students in this field, where the risk of acquiring orthorectic tendencies is highlighted [1, 6, 13, 15, 16, 20]. As an example, a Turkish study conducted among 1,429 respondents who were dietetic students and dietitians, using, among others, the modified ORTO-11 questionnaire, showed a higher prevalence of orthorexia among students (63.80 %) than among those already working in the profession (52.90 %), but the percentages were high in each group. The authors of the study further indicated that successful completion of the studies reduced the odds of orthorexia [6]. In a systematic review developed on orthorexia and other eating disorders, nursing students were mentioned, where it was noted that they were 84.50 % more likely to develop an eating disorder and 45.30 % more likely to develop orthorexia compared to other identified groups of adolescents [24]. The present study, regardless of the cut-off point used, indicated the highest percentage of those characterized by orthorectic disorders among dietetics (90 % for a < 40-point threshold and 30 % for a < 35-point threshold) and nursing (74.10 % and 23.30 %, respectively).

Recent reports suggest a possible link between orthorexia and the cases of people with gastroenterological conditions, although the lack of research in this area is highlighted [11, 26], attention is also given to other chronic diseases requiring dietary adherence or modification, including obesity, polycystic ovary syndrome and diabetes [17]. The current study is one of the few to also highlight the importance of having a chronic disease and selected somatic complaints for the prevalence of orthorectic disorders, where a significant relationship ($p = 0.03$) for the association of orthorexia with a chronic condition in the respondents (cut-off point < 40 in the ORTO-15 test) and again a significant relationship ($p = 0.01$) for the somatic complaints experienced by the respondents (including gastrointestinal and other complaints) and the simultaneous

display of orthorectic tendencies (cut-off point < 35 in the ORTO-15 test). Few publications present research findings on risk factors for orthorexia suggesting the need to extend them further. An example of the area for which research should be extended is the concept of cultural relevance in the prevalence of orthorexia, including in the so-called Western and Eastern cultures with different eating patterns, which would be motivated by the possibility of providing culturally appropriate psychological treatment [4, 14, 18].

While there is no doubt that the disorder known as *orthorexia nervosa* is a growing phenomenon, there is currently no consensus in the scientific community regarding its clinical classification, an unambiguous diagnosis (including the use of a single, reliable screening tool) and unanimity regarding the most presented risk factors, which poses a challenge for further research in this area.

Conclusions

On the basis of the study, the difficulty of confirming or rejecting the formulated hypotheses was confirmed.

1. H1 and H2 hypothesis were rejected. Thus, the level of education, studying a medical degree or having a medical degree does not significantly affect the risk of orthorexia.
2. H3 hypothesis was rejected. There is no significant effect of the respondents' age and gender on the risk of orthorexia regardless of the cut-off point used.
3. Hypothesis H4 was partially confirmed. A significant relationship was observed between a BMI value indicating normal weight and the risk of orthorexia, but only for a cut-off point of < 35 points.
4. Hypothesis H5 was partially confirmed. A significant effect of the presence of chronic diseases (for a cut-off point of < 40 points) and the presence of complaints (for a cut-off point of < 35 points) on the risk of orthorexia was observed.

The confirmation of a statistically significant relationship for only one of the cut-off points used between the presence of orthorexia and the above-mentioned factors indicates that further research is needed to definitively confirm or reject the presence of a correlation.

Postulates

The results obtained, as in the case of the studies of other authors, indicate an imperfection of the ORTO-15 test resulting in the overdiagnosis of *orthorexia nervosa*.

The research suggests the need for further studies to improve the orthorexia diagnostic tool due to the lack of unanimity among researchers regarding the versions of the test used and the cut-off points for diagnosis of this disorder. This results in a lack of ability to properly compare data, as well as to reliably assess the true prevalence of

orthorexia in the population and the factors having a significant impact on its occurrence.

Limitations of the study

The failure to obtain optimally similar numbers of comparison groups of study subjects in terms of age (academic and older), gender, education (medical/non-medical), having or not having chronic diseases, experiencing or not experiencing somatic complaints and a BMI (normal/non-normal) might have made it partially difficult to confirm/exclude the potential impact of these factors on the occurrence of orthorectic disorders.

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CZĘSTOŚĆ WYSTĘPOWANIA ORAZ WYBRANE CZYNNIKI RYZYKA ROZWOJU ORTOREKSJI Z WYKORZYSTANIEM TESTU ORTO-15

Streszczenie

Wprowadzenie: Zjawisko ortoreksji uznawane jest za dość powszechne, jednak częstość jego występowania jest trudna do oszacowania. Celem pracy była próba oszacowania częstości występowania ortoreksji oraz wyodrębnienia potencjalnych czynników ryzyka rozwoju tego zjawiska. Badanie ankietowe przeprowadzono w kwietniu 2023 roku wśród studentów Wydziału Nauk o Zdrowiu Akademii Nauk Stosowanych w Nowym Sączu oraz za pośrednictwem mediów społecznościowych. W przebiegu badania wykorzystano autorski kwestionariusz ankiety oraz standaryzowany kwestionariusz ORTO-15. Przyjęto dwa punkty odcięcia < 35 i < 40 pkt. Analizę wyników przeprowadzono z wykorzystaniem testu U Manna-Whitneya, testu niezależności chi-kwadrat oraz alfy-Cronbacha.

Wyniki i wnioski: Częstość występowania tendencji ortorektycznych dla punktu odcięcia wynoszącego < 40 pkt została oszacowana na poziomie 77.78 %. Obniżenie punktu odcięcia do < 35 pkt skutkowało spadkiem częstości występowania zjawiska w badanej grupie do 24.69 %. Dla punktu odcięcia wynoszącego < 40 pkt zależność istotną statystycznie otrzymano pomiędzy występowaniem ortoreksji a występowaniem chorób przewlekłych. Analiza przeprowadzona na poziomie punktu odcięcia < 35 pkt wykazała zależność statystycznie istotną pomiędzy występowaniem ortoreksji a wartością BMI oraz występowaniem dolegliwości chorobowych. Pozostałe czynniki nie różniły się istotnie dla żadnego z założonych punktów odcięcia. Bazując na uzyskanych wynikach autorzy podkreślają konieczność prowadzenia dalszych badań nad wykorzystaniem i stworzeniem użytecznej adaptacji narzędzia ORTO-15 w określaniu częstości występowania oraz czynników ryzyka rozwoju ortoreksji.

Słowa kluczowe: ortoreksja, test ORTO-15, BMI, wykształcenie medyczne, choroby przewlekłe 