

The prevalence and risk factors of orthorexia nervosa among school-age youth of Pomeranian and Warmian-Masurian voivodeships

Izabela Łucka¹, Patryk Domarecki¹, Dorota Janikowska-Hołoweńko²,
Teresa Plenikowska-Ślusarz³, Małgorzata Domarecka⁴

¹Department of Developmental, Psychotic and Geriatric Psychiatry,
Medical University of Gdansk

²Dr Jadwiga Titz-Kosko Regional Hospital for Rheumatic Disease in Sopot

³University of Gdansk, School of Management

⁴University of Gdansk, School of Social Sciences

Summary

Aim. The aim of the study was to determine the prevalence of orthorexia nervosa among school-age youth from Pomeranian and Warmian-Masurian voivodeships, as well as search for factors which enhance the risk of orthorexia nervosa. An attempt was made to find differences in occurrence of orthorexia nervosa among youth from big cities and small towns.

Material and Method. The study group consisted of 864 subjects (599 females and 265 males). The mean age of female participants was 20.21±/−3.27 years, and of male participants – 18.93±/−3.67 years. In the study, we used a proprietary questionnaire to collect patient data, as well as following diagnostic questionnaires: ORTO-15 by Donini et al. (Polish version validated by Stochel, Janas-Kozik et al.), EAT-26 by Garner and Garfinkel, MOCI (Maudsley Obsessive-Compulsive Inventory) by Hodgson and Rachman, and BDI-II (Beck Depression Inventory II) by Beck. The results were statistically analyzed.

Results. 27% of subjects were found to be at risk of orthorexia nervosa (score of 35 was considered as cut-off point). The highest score of risk was observed in the group of students of junior secondary school, the lowest in the group of students of senior secondary school. There were no statistically significant differences in the risk of orthorexia in groups from big city and small town. Studied social factors did not show impact on the risk of orthorexia. Individuals with suspected orthorexia have notably higher BMI. There were no statistically significant differences in occurrence and severity of depression in the study group. Depression occurred in 25% of the subjects; the link between depression and orthorexia was not confirmed.

Conclusions. On the basis of the study, it was indicated that the group of the highest risk are students of junior secondary school, probably because of the great interest in physical attractiveness in this period of life, as well as individuals with higher BMI. We believe that for

more effective diagnosis it would be advisable to adopt a cut-off point for orthorexia in the ORTO-15 at the level of 35 points, as postulated by Stochel, Janas-Kozik et al. The 40-point threshold is associated with considerable overdiagnosis of the phenomenon.

Key words: orthorexia, eating disorders, prevalence, youth

Introduction

In developed countries, including Poland, in recent couple of years a growing problem of obesity and related diseases and complications has been observed. The statistics on the prevalence of this phenomenon in Poland are becoming more and more alarming [1]. The Institute of Food and Nutrition periodically publishes recommendations on rational diet; healthy dietary products and physical activity are also promoted by numerous campaigns in the mass media. The aim of these actions is to prevent diseases linked with incorrect nutrition [2, 3]. Despite that, some controversies are arising around the idea of healthy diet. Many people offer nutritional programs that are not consistent with evidence-based recommendations but, owing to good advertising and manipulation, attract lots of potential clients. Additional element which deepens the problem in Poland is the fact that the Polish core curriculum in the field of nutritional education is definitely insufficient, which hits the youngest generations. Not surprisingly a lot of people, including youth, have difficulties in finding themselves in the chaos of information whose reliability is hard to resolve.

For about a dozen years scientists have been observing a new problem – excessive, pathological concentration on healthy nutrition, named by Steven Bratman in 1997 orthorexia nervosa. The prefix *ortho* means ‘correct’, *orexis* means ‘hunger, appetite’, the whole term refers to anorexia nervosa [4]. The focus of orthorexia nervosa is to reach optimum health through strict dietary control [5]. Individuals with orthorexia are focused on the quality rather than quantity of the food they eat. Orthorexics spend copious amounts of time checking the sources of foods, processing procedures, preservative content, and materials used for packaging. The ways of preparing meals are no less important for them. Orthorexia also involves the need to hoard food products and to weigh or measure them, as well as planning meals ahead, and obsessive thoughts about food when performing other tasks [6].

A four-stage description of daily behavior of patients was obtained. Stage one involves excessive thoughts on food to be eaten on a given day and the following days. Next stage involves gathering of food products with excessive control and criticism. The third stage involves careful meal preparation ensuring its perfect compliance with healthy eating principles. Finally, the feeling of accomplishment or failure follows, depending on the perceived outcomes of all preceding stages [7].

Orthorexia does not lead to the optimal nutritional status – on the contrary, it entitles concatenation of possible somatic complications, vitamin and microelements deficiencies, disorder of acid-base equilibrium and water and electrolyte balance. Specified literature provides descriptions of crucial complications in the course of orthorexia, for example: severe hyponatremia, hypokalemia, metabolic acidosis, subcutaneous emphysema and mediastinal emphysema, pancytopenia [8].

Aim

The aim of the study was to determine the prevalence of orthorexia nervosa among school-age youth and young adults from Pomeranian and Warmian-Masurian voivodeships. On the basis of research the link between orthorexia and demographic data, social and family factors, considering differences between subjects from big cities and small towns, was determined.

Material and methods

The study group consisted of 864 subjects, including 599 females and 265 males, aged 13–30 years. Among them, there were 185 junior secondary students (99 girls and 86 boys), 167 senior secondary students (112 girls and 55 boys) and 512 university students (288 females and 124 males). The age range in female subgroup was 13–29 years with the mean age of 20.21 ± 3.27 years. The age range in male subgroup was 13–30 years with the mean age of 18.93 ± 3.67 years. The lowest and highest BMI scores in the studied females were 14.71 and 34.38, respectively, with the mean score of 20.8 ± 2.85 . The lowest and highest BMI scores in studied males were 15.57 and 35.75, respectively, with the mean score of 22.62 ± 3.3 .

The survey used in the research consisted of five questionnaires:

1. A proprietary questionnaire to collect basic patient data. It included anthropometric data (age, sex, height, body weight). BMI for each subject was calculated on the basis of their body weight and height. The participants were requested to state the school they attended. Subsequent items collected information on family situation of participants. They were requested to indicate parental level of education (primary, secondary, vocational, university) and their job status (employed in learned profession, employed in other profession, retired/pensioner, unemployed), as well as the number of siblings. Final items addressed substance use habits. The participants were asked whether they were or had ever been smoking. Similar items ascertained alcohol consumption frequency (never, 1–3 times a month, 1–2 times a week, more often) and drug abuse (never, few times in my life, 1–3 times a month, 1–2 times a week, more often). The last item regarded substance dependence in family members (alcohol abuse, smoking, drug abuse, other).
2. ORTO-15 questionnaire – developed by Donini et al. based on Bratman's model and validated in 2005 [9]. It consists of 15 multiple choice items (always, often, sometimes, never), which address obsessive attitude to choosing, buying, preparing and eating healthy foods. The items focus on cognitive (1, 5, 6, 11, 12, 14), clinical (3, 7–9, 15) and emotional (2, 4, 10, 13) aspects of the disorder. Each item can score 1–4 points with behaviors related to high risk of orthorexia scoring 1, and healthy eating-related behaviors scoring 4 points. Total score ranges between 15 and 60 points. The risk of orthorexia negatively correlates with the scores, with high scores indicating healthy eating-related behavior. Donini established the score of 40 as the cut-off value. The Polish version of the questionnaire was validated in 2015 by Stochel, Janas-Kozik et al. who determined the score of 35 as the cut-off value [10].

3. Eating Attitude Test (EAT-26) was developed in 1982 by Garner and Garfinkel [11]. As an instrument to assess eating attitude, each item is intended to probe symptoms of eating disorder belonging to one of three categories: diet, bulimia with excessive focus on eating, and oral control. Each item can score 3, 2, 1 or 0 points, depending on symptom severity. It is used for population screening. Total scores fall in the range of 0–78. The risk of eating disorder increases with the score. The score of 20 or more indicates the presence of eating disorder. The Polish version of EAT-26 was validated by Włodarczyk-Bisaga and Żechowski [12].
4. Maudsley Obsessive Compulsive Inventory (MOCI) – developed in 1977 by Hodgson and Rachman, is used for population screening for obsessive-compulsive disorder. It consists of 30 true/false items, which quantify the general “obsessiveness”, as well as its subscales: checking, cleaning, slowness and doubting. Scoring depends on the number of abnormal responses to items addressing general obsessiveness and individual subscales, with the maximum achievable score of 30. The risk of OCD increases with the score [13].
5. BDI-II (Beck Depression Inventory II), Beck Depression Inventory II is the successor of the BDI developed by Aaron Beck. Revised version of the inventory consists of 21 questions about variety of depressive symptoms with 4 options of answers marked from 0 (not occur) to 3 points (severe symptom). Items regarding change of appearance, difficulties at work, weight loss, and somatic complaints were deleted from the inventory and replaced with new items regarding arousal, feeling of hopelessness, loss of energy, and problems with concentration. The inventory also includes the following aspects: sadness, pessimism, failure, lack of pleasure, guilt. According to DSM-IV, the scale takes into consideration severity of the symptoms within 2 weeks. [14]

The study was concluded in Gdansk and Gdynia (Pomeranian voivodeship), with a population of approximately 400 thousand inhabitants and 250 thousand inhabitants, respectively, and also in Morag (Warmian-Masurian voivodeship), with a population of 15 thousand inhabitants. We randomly selected 2 junior secondary schools in Morag municipality, 1 junior secondary school in Tricity area, 1 senior secondary school in Morag municipality, 1 senior secondary school in Tricity area, as well as three universities in Gdansk. The research was carried out in the following schools: Junior Secondary School no. 1 in Morag, Junior Secondary School no. 2 in Morag, Junior Secondary School no. 23 in Gdynia, Senior Secondary School no. 2 in Morag, Senior Secondary School no. 2 in Gdynia, Gdansk University of Technology, University of Gdansk, and Medical University of Gdansk. Having obtained the consent of school head teachers, all study procedures were approved by the Independent Bioethical Committee (NKBBN/602/2015-2016).

In junior and senior secondary schools, two groups of first, second and third year students were randomly selected with survey carried out during the form time. At universities, we randomly selected 6 student groups per a university carrying out our research during breaktime between lecture sessions. All participants were briefed about issues covered in the research and its procedures. Each participant gave their

voluntary, written informed consent to participation in research with the possibility to withdraw from participation at any time. In participants below 18 years of age, parental/legal guardian's consent was additionally sought. In secondary schools, the survey was supervised by form tutors of respective groups, who reported to the researchers, while at universities the survey was carried out by the researchers themselves.

Statistical analysis

The arithmetic mean was used for describing the average intensity of quantitative variables in the study group, with standard deviation quantifying the amount of variation. The Shapiro-Wilk W -test was used to verify the distribution normality of the analyzed variables. Since the distribution differed significantly from the normal, the non-parametric Mann-Whitney U test and Kruskal-Wallis test were used for the comparison of 2 variables and three variables, respectively. In order to verify distribution normality of qualitative data (categorical variables), structural indices were used, whereas the χ^2 test of association and independence was used to compare distributions and determine the association between the variables. The strength of correlation was measured using the Spearman's correlation coefficient. The value of $p \leq 0.05$ was considered statistically significant. Statistical analyses were carried out using IBM SPSS Statistics v. 23 and Statistica 12 software.

Results

Risk of orthorexia

The study showed the prevalence of orthorexia among examined population at the level of 27% when the cut-off value in the ORTO-15 at the level of 35 points was taken into consideration. If a 40 points cut-off value was taken into consideration, the prevalence of the phenomenon among the subject would be at the level of 76.7%

The risk of orthorexia was confirmed in 27.8% (240 persons) of participants. Similar level of prevalence was found in groups which differed in terms of educational level (Table 1). It was around 23.8% to 29.7%. There were no statistically significant differences ($\chi^2 = 2.572$; $p = 0.138$)

The assumption was made that at each level of education some differences may occur in regard to the place of residence (small town – big city) or type/profile of education (Table 1).

Table 1. **Orthorexia and the level and place of education**

Level of Education	Number people	Percentage of people with orthorexia (%)
University	152	29.7
Senior high school	44	26.3
Junior high school	44	23.8

table continued on the next page

University	Medical University of Gdansk	64	26.2
	Gdansk University of Technology	58	31.4
	University of Gdansk	30	36.1
Senior high school	Gdynia	21	31.3
	Morag	23	23.0
Junior high school	Gdynia	14	28.6
	Morag	30	22.1

The percentage of people at risk of orthorexia, depending on the group, was 22.1% to 36.1%. There were no statistically significant differences in the prevalence of risk of orthorexia between students of various universities ($\chi^2 = 3.301$; $p = 0.192$), between senior high school students from small towns and big cities ($\chi^2 = 1.439$; $p = 0.230$) and between junior high school students from small towns and big cities ($\chi^2 = 0.843$; $p = 0.272$).

It was examined whether sex differentiates the risk of orthorexia in the general population and in groups distinguished by the level of education and place of residence (Table 2).

Table 2. Risk of orthorexia and sex, level of education and place of residence

Specification		Women		Men	
		Number of people	Percentage (%)	Number of people	Percentage (%)
All		174	29.0	66	25.1
University		114	29.4	38	30.9
Senior high school		33	29.5	11	20.4
Junior high school		27	27.3	17	19.8
University	Medical University of Gdansk	50	27.0	14	23.7
	Gdansk Technical University	35	28.5	23	37.7
	University of Gdansk	29	36.3	1	33.3
Senior high school	Gdynia	15	33.3	6	27.3
	Morag	18	26.9	5	15.6
Junior high school	Gdynia	8	25.8	6	33.3
	Morag	19	27.9	11	16.2

The prevalence of risk of orthorexia among men and women was at the same level. The occurring differences were not statistically significant for all of the subjects ($\chi^2 = 1.171$; $p = 0.278$), among university students ($\chi^2 = 0.113$; $p = 0.736$), senior high school students ($\chi^2 = 1.469$; $p = 0.226$), and junior high school students ($\chi^2 = 1.430$; $p = 0.232$). Furthermore, it was found that in the group of people at risk of orthorexia, the percentage of women was the same regardless of the level of education ($\chi^2 = 0.163$;

$p = 0.922$). There were no statistically significant differences in the percentage of women at risk of orthorexia between universities ($\chi^2 = 2.364$; $p = 0.308$), senior high school students from small towns and big cities ($\chi^2 = 0.542$; $p = 0.462$) and junior high school students from small towns and big cities ($\chi^2 = 0.049$; $p = 0.826$). It was also not observed that sex was a statistically significant factor differentiating the incidence of orthorexia among students of the Medical University of Gdansk ($\chi^2 = 0.251$; $p = 0.616$), Gdansk Technical University ($\chi^2 = 1.616$; $p = 0.204$), University of Gdansk ($\chi^2 = 0.000$; $p = 1.000$), senior high school in Gdynia ($\chi^2 = 0.252$; $p = 0.616$), senior high school in Morag ($\chi^2 = 1.534$; $p = 0.215$), and junior high school in Gdynia ($\chi^2 = 0.055$; $p = 0.815$). A significant difference was observed only among students of junior high school in Morag ($\chi^2 = 2.737$; $p = 0.048$) – where the percentage of women was significantly higher than men.

In this work, we analyzed distinctiveness of risk of orthorexia among population of Morag (small town) and Gdynia or Gdansk (big cities).

Level of orthorexia.

In people at risk of orthorexia, its level was examined and results were compared between groups considering sex, level and place of education. There were no statistically significant differences in the level of orthorexia between men and women ($z = 0.678$; $p = 0.498$), between students at different levels of education ($\chi^2 = 0.141$; $p = 0.924$), between students of different universities ($\chi^2 = 0.762$; $p = 0.684$), between senior high school students from big cities and small towns ($z = 1.538$; $p = 0.124$), and between junior high school students from big cities and small towns ($z = 0.452$; $p = 0.651$).

Statistically significant difference was observed only in the case of the level of education (Kruskal-Wallis $\chi^2 = 8.074$; $p = 0.036$). The lowest mean score of the ORTO-15 questionnaire, which is the highest index of risk of orthorexia, was observed among junior high school students – 32.23 (± 2.45), relatively the lowest intensification of orthorexic behavior was observed among senior high school students 32.66 (± 2.10). Mean score of the questionnaire among university students was 32.44 (± 2.45).

Risk of orthorexia and eating disorders

The prevalence of coexistence of risk of orthorexia and eating disorders in groups considering sex, level and place of education of subjects is presented in Table 3.

Table 3. Prevalence of risk of orthorexia and eating disorders

Specification	Eating disorders			
	Yes		No	
	Number of people	Percentage (%)	Number of people	Percentage (%)
All	61	62.2	179	23.4
University	38	76.0	114	24.7

table continued on the next page

Senior high school		10	40.0	34	23.9
Junior high school		13	56.5	31	19.1
University	Medical University of Gdansk	13	72.2	51	22.6
	Gdansk Technical University	15	71.4	43	26.2
	University of Gdansk	10	90.9	20	27.8
Senior high school	Gdynia	5	38.5	16	29.6
	Morag	5	41.7	18	20.5
Junior high school	Gdynia	4	57.1	10	23.8
	Morag	9	56.3	21	17.5

As a result of this research it was indicated that the risk of orthorexia was more common among individuals with eating disorders. The prevalence of orthorexia in this group, as compared with the group without eating disorders, was significantly higher among all examined subjects ($\chi^2 = 62.456$; $p < 0.001$) and at particular levels of education: university ($\chi^2 = 56.956$; $p < 0.001$), senior high school ($\chi^2 = 2.824$; $p = 0.047$), junior high school ($\chi^2 = 15.530$; $p < 0.001$). The risk of orthorexia among individuals with eating disorders, as compared with individuals without such disorders, is 5.4 times higher in the case of all examined subjects, 9.7 times higher among individuals with higher education, 2.1 times higher among individuals with senior high school education, and 5.5 times higher among individuals with junior high school education. Furthermore, it was tested if the type of education, sex or place of residence differentiate the risk of orthorexia among individuals with eating disorders. It was indicated that type of university ($\chi^2 = 1.722$; $p = 0.424$), place of residence of senior high school students ($\chi^2 = 0.000$; $p = 1.000$) and place of residence of junior high school students ($\chi^2 = 0.000$; $p = 1.000$) do not differentiate the incidence of risk of orthorexia.

The research indicates that the risk of orthorexia is significantly higher among individuals with eating disorders, both women ($\chi^2 = 58.300$; $p < 0.001$) and men ($\chi^2 = 6.376$; $p = 0.012$).

In the group of individuals at risk of orthorexia, direction and intensity of the correlation between results of the ORTO-15 and the EAT-26 was tested.

Table 4. Results of the ORTO-15 and results of the EAT-26 in the group at risk of orthorexia according to sex and level of education (Spearman's r coefficient)

Specification			EAT sum	EAT diet	EAT bulimia	EAT oral control
All	n = 240	r	-0.328	-0.307	-0.259	-0.109
		p	<0.001	<0.001	<0.001	0.093
Women	n = 174	r	-0.361	-0.315	-0.307	-0.114
		p	<0.001	<0.001	<0.001	0.133

Men	n = 66	r	-0.361	-0.315	-0.307	-0.114
		p	<0.001	<0.001	<0.001	0.133
University	n = 152	r	-0.391	-0.360	-0.311	-0.232
		p	<0.001	<0.001	<0.001	0.004
Senior high school	n = 44	r	-0.189	-0.25	-0.174	0.220
		p	0.219	0.102	0.259	0.152
Junior high school	n = 44	r	-0.257	-0.211	-0.18	-0.031
		p	0.092	0.170	0.242	0.843

It was indicated that the higher the total risk of eating disorders, in terms of diet or bulimia, the significantly higher is the risk of orthorexia in all participants, among women, men and university students. In the examined groups, except the senior high school students, there was no significant correlation between the results of the EAT-26 in terms of oral control and intensity of risk of orthorexia. In the case of senior and junior high school students, there was no significant correlation between the results of the EAT-26 and the ORTO-15; the level of risk of orthorexia is not related to the level of eating disorders.

Risk of orthorexia and BMI

The present study indicates that individuals with suspected orthorexia have significantly higher BMI ($p = 0.021$). The BMI level among individuals with suspected orthorexia was 21.62 (± 2.99), and in the group without orthorexia it was 21.56 (± 3.15).

The direction and intensity of correlation between the results of the ORTO-15 and BMI were tested in the group of individuals at risk of orthorexia. The results are shown in Table 5.

Table 5. Results of the ORTO-15 and BMI in the group at risk of orthorexia according to sex and level of education (Spearman's r coefficient)

Specification	All	Women	Men	University	Senior high school	Junior high school
R	-0.043	-0.021	-0.214	0.069	-0.124	-0.439
P	0.517	0.794	0.087	0.403	0.433	0.005

In the group of individuals at risk of orthorexia, there was no evidence of significant relation between score of the ORTO-15 and the level of BMI among women, men, university students, and senior high school students. However, among junior high school students the higher the BMI indicated the higher risk of orthorexia.

The risk of orthorexia according to demographic and social factors

In the group of individual with suspected orthorexia, we examined the level of risk of orthorexia with regard to tested social and demographic factors.

Table 6. Demographic and social factors and BMI of participants

Feature		Orthorexia+ n = 240	Orthorexia- n = 624	Test/p-value
Sex	women	72.5% (174)	68.3% (425)	$\chi^2 = 1.422$ $p = 0.133$
	men	27.5% (66)	31.7% (197)	
Age	Mean (years)	19.95 (± 3.14)	19.77 (± 3.56)	Mann-Whitney U $z = 0.475$ $p = 0.635$
Level of education	Junior high school	18.3% (44)	22.6% (141)	$\chi^2 = 2.572$ $p = 0.138$
	Senior high school	18.3% (44)	19.7% (123)	
	University	63.3% (152)	57.7% (360)	
Mother's level of education	Primary	2.5% (6)	2.6% (16)	$\chi^2 = 2.152$ $p = 0.271$
	Vocational	15.1% (36)	19.4% (120)	
	Secondary	28.6% (68)	27.0% (167)	
	Higher	53.8% (128)	51.0% (315)	
Professional status of the mother	employed in her profession	51.5% (123)	53.1% (325)	$\chi^2 = 0.854$ $p = 0.836$
	employed out of her profession	28.9% (69)	29.1% (178)	
	retired	4.6% (11)	5.1% (31)	
	unemployed	15.1% (36)	12.7% (78)	
Father's level of education	Primary	4.6% (11)	3.0% (18)	$\chi^2 = 3.262$ $p = 0.354$
	Vocational	33.3% (79)	33.6% (204)	
	Secondary	17.7% (42)	22.0% (134)	
	Higher	44.3% (105)	41.4% (252)	
Professional status of the father	employed in his profession	53.8% (127)	52.4% (314)	$\chi^2 = 1.275$ $p = 0.734$
	employed out of his profession	36.9% (87)	36.2% (217)	
	retired	6.4% (15)	8.7% (52)	
	unemployed	3.0% (7)	2.7% (16)	
Number of siblings	mean	1.46 (± 1.08)	1.44 (± 1.20)	Mann-Whitney U $z = 0.598$ $p = 0.550$
BMI	mean	21.62 (± 2.99)	21.56 (± 3.15)	Mann-Whitney U $z = 2.300$ $p = 0.021$

As a result of the conducted analysis it was indicated that the distribution of socio-demographic factors in the group at risk of orthorexia was not significantly different than in the group without such risk, which means that none of these factors was statistically significant related to the risk of orthorexia. It was indicated that there were no significant differences between mean score of the ORTO-15 in the case of sex ($p = 0.498$), parental level of education (mother $p = 0.979$; father $p = 0.606$), and their professional status (mother $p = 0.910$; father $p = 0.777$).

Risk of orthorexia and the use of psychoactive substances

There was no statistically significant relation between occurrence of orthorexia and the use of stimulants by examined individuals or their relatives. Also in the group of individuals with suspected orthorexia there were no significant differences in the mean score of the ORTO-15 regarding frequency of alcohol use ($p = 0.498$), drug use ($p = 0.498$), smoking ($p = 0.498$), and the use of stimulants at home ($p = 0.498$) (Table 7).

Table 7. The use of psychoactive substances by examined individuals and their relatives

Specification		Orthorexia + n = 240	Orthorexia – n = 624	Test/p-value
Alcohol	do not drink	28.5% (68)	32.3% (201)	$\chi^2 = 1.485$ $p = 0.686$
	1–2 times a week	16.3% (39)	15.1% (94)	
	1–3 times a month	53.1% (50.0)	50.0% (311)	
	more often	2.1% (5)	2.6% (16)	
Drugs	never	78.4% (188)	81.9% (508)	$\chi^2 = 1.729$ $p = 0.842$
	couple of times	18.3% (44)	15.8% (98)	
	taking	3.3% (8)	2.3% (14)	
Cigarettes	never smoked	65.7% (157)	68.6% (426)	$\chi^2 = 0.669$ $p = 0.716$
	smoked	18.8% (45)	17.2% (107)	
	smoking	15.5% (37)	14.2% (88)	
Psychoactive substances used by relatives	none	60.2% (136)	62.7% (372)	$\chi^2 = 2.618$ $p = 0.454$
	alcohol	9.3% (21)	6.7% (40)	
	cigarettes	29.6% (67)	30.2% (179)	
	drugs	0.9% (2)	0.3% (2)	

Risk of orthorexia and depression

The percentage of people with depression in both studied groups was equal and was 25% (Table 8).

Table 8. Risk of orthorexia and occurrence of depression

Specification	Orthorexia +		Orthorexia –	
	Number of people	Percentage (%)	Number of people	Percentage (%)
Depression	60	25.0	156	25.0

There were no statistically significant differences in the severity of depression between groups. The level of depression in the BDI-II in the group at risk of orthorexia was 9.23 (± 8.87) and did not differ significantly ($p = 0.224$) from the level in the group without risk of orthorexia, in which it was 8.71 (± 4.46). In the group of people with orthorexia, a significant relationship was found between the result of the ORTO-15 and the result of the BDI-II ($r = -0.128$; $p = 0.048$). The obtained result informs that in the group of individuals at risk of orthorexia an increase in this risk results in an increase in the severity of depression. This finding was not observed in the group of individuals without the risk of orthorexia.

Discussion

Since orthorexia was first described only 20 years ago, there has been no extensive research on its prevalence and the available studies often offer conflicting results depending on the analyzed population and the adopted diagnostic criteria. In the present research, the prevalence of orthorexia among the population of youth and young adults was estimated at the level of 27% taking into consideration 35 points as a cut-off value. While considering a higher cut-off point – 40 points – risk of orthorexia was at the level of 76.7%. Both of these cut-off values are not accidental. The 40-point cut-off value was suggested by the author of the original publication on the validation of the ORTO-15 – Donini [9]. The 35-point cut-off value was proposed by Stochel, Janas-Kozik et al. who conducted the Polish validation of the ORTO-15. In this study, the compliance of diagnosis of orthorexia and eating disorders was proven to be only 47.2% at the level of 40 points and as much as 88.2% for 35 points. On this basis, the authors of the Polish validation of the test suggested a 35-point threshold [10].

The results presented in our study also suggest that the use of a higher threshold for the diagnosis of orthorexia results in overdiagnosis. The ORTO-15 as a screening test to identify a group of people at risk of orthorexia, however, the value of the test becomes negligible when it identifies over 75% of cases. According to this assumptions, it should be assumed that three-fourths of the examined population should be diagnosed towards eating disorders. In our study, approx. 50% of respondents fall within the range of 35–40 points in the ORTO-15 test. Taking into account the questions posed in the test and the growing tendency among the population to be interested in the issue of a healthy lifestyle, it can be assumed that there are probably people in this range who have in mind healthy eating, without pathological features.

The prevalence of orthorexia in this study is much higher than in Donini's study – the author of the original publication on the aforementioned diagnostic test. In the original study, the risk of orthorexia was determined as 6.9% [9]. Turkish research

conducted by Bağcı Bosi et al. in 2007 and 2011 described the prevalence of orthorexia among Turkish population at the level of 45.5% and 57.6%, respectively [16]. On the contrary, in the study conducted by Stochel, Janas-Kozik et al. the prevalence of orthorexia among Polish population was at the level of 13.7%. There is a huge discrepancy between the results of various studies and it seems that it is not only a result of different cut-off value used by researchers (40 points in foreign analyses, 35 points in the study by Stochel, Janas-Kozik et al. and in the present study). Nonetheless, some kind of pattern can be observed. Namely: studies conducted nowadays tend to show higher prevalence of orthorexia than studies conducted couple years ago. Probably it is associated with the change in the way of thinking about lifestyle and nutrition, which is taking place in societies and with the increasing awareness about nutrition and its impact on health. Perhaps it also proves that there is a need to consider the introduction of orthorexia as a separate sub-unit in the group of eating disorders..

Another conclusion from the research is a correlation between orthorexia and socio-demographic features of subjects. The link between level of education and orthorexia was observed. The highest coefficient was found among junior high school students, the lowest among high school students. Presumably we can search for the explanation of this phenomenon in the differences in the mentality of junior and senior high school students and their different perception of own body and attractiveness. The age of students attending junior secondary school usually coincides with puberty when adolescents mostly go through a turbulent period of dissatisfaction with their own body, make frequent attempts to change their own appearance, implement diets without reliable knowledge about the principles of proper nutrition. Senior high school students, on the other hand, seem to be more mature, they begin to change perception of their self-esteem, which is no longer based only on appearance, but also on features of character and other attributes. In comparison, Donini has proven positive correlation between the risk of orthorexia and age [15].

There were no differences in terms of sex, education and professional status of parents in both groups in the present study. Therefore our observations do not confirm common opinion that women care more about health and more often choose healthy lifestyle. Donini has shown more frequent occurrence of orthorexia among men [15], but the Turkish study from 2011 showed the tendency for occurrence of orthorexia among women in Turkish population [16]. Polish study conducted by Hrynik has shown significantly higher prevalence of orthorexia among children of working parents [17], however, our study has not shown any significant correlations with parental level of education or professional status. Therefore the social factors appear to have little impact on the risk of orthorexia among youth and young adults.

The influence of the use of psychoactive substances among the subjects and their parents on the risk of orthorexia has not been proven. Different results were presented by Hrynik who has proven higher risk of orthorexia among smoking youth [17]. These results may appear surprising. Smokers and individuals drinking alcohol are typically associated with those who do not care about health and should not show any signs of orthorexic behavior. There may be loads of reasons of such results. When it comes to drinking alcohol: this activity became very common, it is often an inherent part of

meetings, especially in Poland, that it is no longer seen as unhealthy. Moreover, published studies gave reasons to believe that consuming small amounts of alcohol has a positive impact on circulatory system. Perhaps that is why the risk of orthorexia in drinking individuals is not lower than among non-drinkers. As far as tobacco addiction is concerned, it must be remembered that smokers often do not allow themselves to think about the harmful effects of smoking and do not consider this activity in terms of health and illness. In this light, it is not surprising that there is no correlation between the risk orthorexia and smoking/non-smoking.

The present study has proven the correlation between orthorexia and BMI. The higher BMI, the higher the risk of orthorexia. Studies performed by other authors mostly overlap with this conclusion. Turkish study from 2015, American study conducted by students [18] and research conducted by Hrynik have shown significantly higher risk of orthorexia with increasing BMI. Amongst studies to which we referred in this article only the original work of Donini does not confirm the correlation between orthorexia and BMI. Obese individuals or ones with excessive weight may have a higher tendency to focus on food, which may arise from the pursuit of losing weight. Moreover most of people links the desire of losing weight with very strict limitations of consumed food and as a result of insufficient or lack of fundamental knowledge about nutrition starves themselves instead of implementing proper nutrition [19, 20].

In this study we tried to examine differences in the prevalence of risk of orthorexia among populations of small towns and big cities. The presented results clearly suggest no differences both in the case of level of education and sex of subjects. The only statistically significant difference, which was observed, was that the prevalence of risk of orthorexia was slightly higher among girls in junior high school in small town than among boys from the same area.

Lack of significant differences in the discussed matter seems to be associated with the way of gaining knowledge and patterns of body image, silhouette and attractiveness by youth and young adults from big cities and small towns. Young individuals draw patterns primarily from mass media, social media and other web sources. Access to this means of communication is practically identical regardless of place of residence. Additionally campaigns about knowledge of proper nutrition and healthy lifestyle has reached every school in Poland.

Conclusions

The prevalence of orthorexia within the examined youth and young adults from Pomeranian and Warmian-Masurian voivodeships was 27% when we use 35 points as a cut-off value of the diagnostic test. The use of cut-off value presented by Donini – the author of the ORTHO-15 test – at the level of 40 points may result in significant numbers of overdiagnoses.

There were no differences in the prevalence of orthorexia between the population of individuals from city big or small town.

The factors which show correlation with the risk of orthorexia are BMI and age. The higher the BMI, the higher the risk of orthorexia. Junior high school students are

in the group at the highest risk of orthorexia, while senior high school students – the lowest. Other examined individual and social factors seem to have little impact on the risk of orthorexia.

References

1. Mazur J. *Zdrowie i zachowania zdrowotne młodzieży szkolnej na tle wybranych uwarunkowań socjodemograficznych*. Warsaw: Institute of Mother and Child; 2015.
2. Raymond JL, Amann PL, Cullen JM. *Heart healthy food pyramid*. J. Acad. Nutr. Diet. 2003; 103(Suppl. 9): 39–45.
3. Sacks FM, Appel LJ, Moore TJ, Obarzanek J, Vollmer WM, Svetkey LP. *A dietary approach to prevent hypertension: A review of the Dietary Approaches to Stop Hypertension (DASH) study*. Clin. Cardiol. 1999; 22(7 Suppl.): 6–10.
4. Bratman S. *Health Food Junkie*. Yoga Journal. 1997; September/October: 42–50.
5. Vandereycken W. *Media hype, diagnostic fad or genuine disorder? Professionals' opinions about night eating syndrome, orthorexia, muscle dysmorphia and emetophobia*. Eat. Disord. 2011; 19(2): 145–155.
6. Koven NS, Abry AW. *The clinical basis of orthorexia nervosa: Emerging perspectives*. Neuro-psychiatr. Dis. Treat. 2015; 11: 385–394.
7. Mathieu J. *What is orthorexia?* J. Acad. Nutr. Diet. 2005; 105(10): 1510–1512.
8. Park SW, Kim JY, Go GJ, Jeon ES, Pyo HJ, Kwon YJ. *Orthorexia nervosa with hyponatremia, subcutaneous emphysema, pneumomediastinum, pneumothorax, and pancytopenia*. Electrolyte Blood Press. 2011; 9(1): 32–37.
9. Donini LM, Marsili D, Graziani MP, Imbriale M, Cannella C. *Orthorexia nervosa: Validation of a diagnosis questionnaire*. Eat. Weight Disord. 2005; 10(2): 28–32.
10. 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(1): 119–134. Doi: 10.12740/PP/25962.
11. Garner DM, Olmsted MP, Bohr Y, Garfinkel PE. *The eating attitudes test: Psychometric features and clinical correlates*. Psychol. Med. 1982; 12(4): 871–878.
12. Żechowski C. *Polska wersja Kwestionariusza Zaburzeń Odżywiania (EDI) – adaptacja i normalizacja*. Psychiatr. Pol. 2008; 42(2): 179–193.
13. Thomas J, Turkheimer E, Oltmanns TF. *Psychometric analysis of racial differences on the MOCI. Assessment*. 2000; 7(3): 247–258.
14. Beck A et al. *Beck Depression Inventory II*, Mental Measurements Yearbook; 1996.
15. 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(2): 151–157.
16. Bağcı Bosi AT, Camur D, Güler C. B, et al. *Prevalence of orthorexia nervosa in resident medical doctors in the faculty of medicine (Ankara, Turkey)*. Appetite. 2007; 49(3): 661–666.
17. Hyrnik J, Janas-Kozik M, Stochel M, Jelonek I, Siwiec A, Rybakowski JK. *The assessment of orthorexia nervosa among 1899 Polish adolescents using the ORTO-15 questionnaire*. Int. J. Psychiatry Clin. Pract. 2016; 20(3): 199–203.

18. Bundros J, Clifford D, Silliman K, Neyman Morris M. *Prevalence of orthorexia nervosa among college students based on Bratman's test and associated tendencies*. *Appetite*. 2016; 101: 86–94.
19. Palczewska I, Niedźwiedzka Z. Siatki centylowe wskaźnika względnej masy ciała (BMI) chłopców i dziewcząt warszawskich. In: *Ocena rozwoju somatycznego dzieci i młodzieży*. Practical Medicine Publishing House. 2002; 3: 18.
20. Bratman S, Knight D. *Health food junkies. Orthorexia nervosa: Overcoming the obsession with healthful eating*. New York: Broadway Books; 2000.

Address: Izabela Łucka
Department of Developmental, Psychotic and Geriatric Psychiatry
Medical University of Gdansk
80-282 Gdańsk, Srebrniki Street 17