Psychiatr. Pol. 2017; 51(6): 1133–1144
PL ISSN 0033-2674 (PRINT), ISSN 2391-5854 (ONLINE)
www.psychiatriapolska.pl
DOI: https://doi.org/10.12740/PP/75739

A study on the relationship between orthorexia and vegetarianism using the BOT (*Bratman Test for Orthorexia*)

Anna Dittfeld[1], Katarzyna Gwizdek[2],Paweł Jagielski[3], Anna Brzęk[4], Katarzyna Ziora[5]

[1]Chair and Department of Histology and Embryology, School of Medicine with the Division of Dentistry in Zabrze, Medical University of Silesia in Katowice

[2] Department of Rehabilitation, Faculty of Health Science, Medical University of Silesia in Katowice

[3]Human Nutrition Department, Faculty of Health Science, Jagiellonian University Medical College

[4]Department of Kinesiolgy, Chair of Physiotherapy, School of Health Sciences in Katowice, Medical University of Silesia in Katowice

[5]Department of Pediatrics in Zabrze, School of Medicine with the Division of Dentistry in Zabrze, Medical University of Silesia in Katowice

Summary

Aim. The following article presents the relationship between vegetarianism and orthorexia nervosa (ON). Vegetarianism is an ideology and a way of life that aims at minimizing animal exploitation. A vegetarian diet excludes the consumption of meat together with other animal-derived products. According to scientists, orthorexia nervosa is considered to be a new, yet unclassified eating disorder. It involves introducing dietary restrictions by individuals who feel a desire to improve their health status by healthy eating.

Method. The study involved 2,611 participants, namely 1,346 vegetarians and 1,265 non-vegetarians. The research questionnaire consisted of general personal and anthropometric characteristics, the BOT (Bratman Test for Orthorexia) and questions evaluating the participants' attitude towards nutrition.

Results. Based on the obtained results, health food fanaticism is more specific to vegetarians than non-vegetarians. The risk for orthorexia nervosa decreases with age and diet duration. The biggest number of health food fanatics was found in the group of lacto-vegetarians, a lower number among ovo-vegetarians and lacto-ovo-vegetarians, and the smallest number was observed in the vegan group. Also, vegetarians were reported to have dietary consultations as frequently as non-vegetarians.

Discussion. Very few studies can be found on the relationship between orthorexia nervosa and vegetarianism. Some scientists believe that vegetarians are particularly prone to orthorexia nervosa. In addition, it has been suggested by other researchers that vegetarianism can be used

to mask eating disorders, as it allows these affected individuals to avoid certain products or situations related to food. The direction of cause and effect cannot be determined.

Key words: orthorexia, eating disorders, obsessive-compulsive disorders, vegetarian diet, vegetarianism

Introduction

Vegetarianism is an ideology and a way of life that aims at minimizing animal exploitation. Not only does a vegetarian diet exclude the consumption of meat, but it also eliminates other animal-derived products [1].

Several varieties of a vegetarian diet can be distinguished, however, their common feature is that all of them exclude the consumption of meat and animal-based food products, including fish and seafood [2, 3].

The types of vegetarian diets are as follows:

- lacto-vegetarianism – allows the consumption of dairy products;
- ovo-vegetarianism – allows the consumption of eggs;
- lacto-ovo-vegetarianism – allows the consumption of dairy products and eggs;
- veganism – eliminates all forms of animal products;
- Fruitarianism – allows the consumption of only fruits and vegetables, the gathering of which does not kill the plant;
- Raw vegetarianism – allows the consumption of only raw fruits and vegetables;
- Liquidarianism – allows the consumption of raw food in liquid form;
- Sproutarianism – allows the consumption of only sprouts and seeds [2, 4, 5].

According to scientists, orthorexia nervosa is considered to be a new, yet unclassified eating disorder [6]. It involves introducing dietary restrictions by individuals who feel a desire to improve their health status by healthy eating. Initially, a person eliminates single products, and then sets increasingly stringent restrictions [7]. Finally, hardly any product meets the strict requirements imposed by people with orthorexia [8].

The concept of orthorexia nervosa was proposed in 1997 by Steven Bratman [9]. Since then, a number of studies on orthorexia nervosa has been published, and they looked at its prevalence among various populations [8, 10–12]. Scientists differ as to whether orthorexia is a new eating disorder, a variant of a currently recognized eating disorder, or another disorder. It has features common to obsessive-compulsive disorders, eating disorders and somatoform disorders. Orthorexia and other eating disorders share common characteristics: excessive focus on food issues, strict diet, perfectionism, co-occurrence of anxiety, need for control, stiffness of behavior and rituals related to meal preparation. It is not classified in ICD-10 or in DSM-V [13].

Some authors suggest that vegetarians can be particularly prone to orthorexia nervosa [14, 15]. However, there has been no scientific evidence of such a relationship so far.

Aim of the study

The aim of the research was to evaluate the risk of orthorexia in vegetarians and non-vegetarians using the Bratman Test for Orthorexia (BOT).

Material and methods

The study involved 2,611 participants, namely 1,346 vegetarians and 1,265 non-vegetarians. The research questionnaire was filled in by the participants via the Internet.

The first part of the research was based on general personal and anthropometric characteristics of the study groups such as: age, gender, weight and height. Self-report measures were used to assess height and weight of the participants. The BMI score was calculated using the participants' weight and height (kg/m^2), and the results were classified according to the WHO (World Health Organization) criteria. On the basis of the WHO classification, participants with BMI < 18.5 were defined as underweight, between 18.5 and 24.99 as normal weight, and ≥ 25 as overweight and obese [16].

In the second part of the study, the authors used the BOT (Bratman Test for Orthorexia) created by Steven Bratman. It comprises ten dichotomous items with Yes/No answers. One point is given for every positive answer. Study participants who obtain fewer than 5 points are classified as healthy, 5–9 points as health fanatics, and those who receive 10 points are diagnosed with orthorexia nervosa [17].

The last part of the research was based on the authors' questionnaire in order to evaluate the participants' attitude towards food and nutrition.

Statistical Analysis

The relationships between particular results have been searched sequentially, and the results are shown as numbers (%), mean value (x) and standard deviation (SD). Subsequently, the differences between obtained parameters in both groups have been described. Normal distribution has been verified using the Lilliefors test. Comparisons of statistical significance of differences between mean values of parameters were performed using ANOVA. The Mann-Whitney U test, the Pearson's χ^2 test, Spearman's R and the test between two components of the structure were also used by means of the STATISTICA v.12 Software. The level of statistical significance was set at $p < 0.05$.

Results

The mean age of vegetarians was 25.63±8.67 years (95 CI 25.17–26.10) and of non-vegetarians 23.32±5.94 years (95 CI 22.98–23.64). The average BMI for vegetarians was 21.9±3.75 kg/m^2 (95 CI 22.74–22.14), and for non-vegetarians it was 22.44±3.87 kg/m^2 (95 CI 22.22–22.65). There was a statistically significant difference between the two groups with regard to BMI ($p < 0.001$). The majority of the

respondents were women, i.e., 89.9% of vegetarians and 84.7% of non-vegetarians. Statistically significant differences were also observed with regard to sex ($p < 0.001$). The non-vegetarian group was found to comprise a higher number of men when compared to the vegetarian group (15.3% vs. 10.1%). As far as education is concerned, the majority of the respondents had either higher or secondary school education. In this case, the difference between vegetarian (47%; 40.6%) and non – vegetarian groups (39.9%; 56.8%) was reported to be statistically significant as well ($p < 0.05$) (Table 1 and 2).

Table 1. **Anthropometric characteristics of the study groups**

	Vegetarians								Non-vegetarians						P Values*
	n	X	SD	Me	Min.	Max.	95% CI	n	X	SD	Me	Min.	Max.	95%CI	
Age (years)	1,321	25.60	8.67	23	11	70	25.17–26.10	1,261	23.32	5.93	22	13	66	22.98–23.64	<0.0001
Height (cm)	1,334	167.64	7.08	167	150	196	167.23–167.99	1,268	168.72	7.72	168	146	198	168.31–169.16	0.0002
Weight (kg)	1,332	61.80	12.17	60	31	130	61.15–62.46	1,268	64.10	12.89	62	40	130	63.37–64.79	<0.0001
BMI (kg/m^2)	1,331	21.93	3.75	21.26	13.01	46.09	21.74–22.14	1,264	22.45	3.88	21.72	14.04	42.17	22.22–22.65	0.0005

*Mann-Whitney *U* test

Table 2. **Characteristics of vegetarians and non-vegetarians with regard to sex, education and BMI**

	Vegetarians	Non-vegetarians	P Values*
Sex			
Women	89.9%	84.7%	0.003
Men	10.1%	15.3%	0.17
Education			
Higher	47.0%	39.9%	0.016
Secondary	40.6%	56.8%	0.001
Vocational	1.3%	1.6%	0.67
Primary	11.1%	1.7%	0.6
BMI			

table continued on the next page

Underweight	14.0%	9.5%	0.22
Normal weight	70.2%	70.3%	0.96
Overweight	12.2%	15.9%	0.31
Obesity	3.6%	4.3%	0.85

* structure indicator

The majority of vegetarians were lacto-ovo-vegetarians and vegans. Lacto-vegetarians and ovo-vegetarians comprised a smaller group. Individuals following fruitarian, raw vegetarian, liquidarian and sproutarian diets were among the minority (Figure 1). Sex ($p < 0.001$), level of education ($p < 0.001$) and BMI ($p < 0.001$) had influenced the type of the used diet.

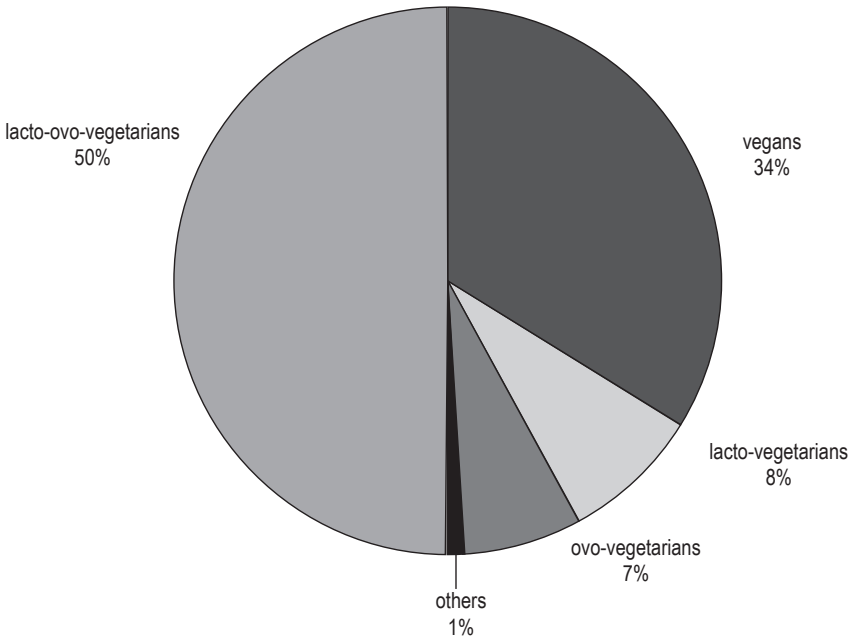

Figure 1. **Types of vegetarian diet**

There was no statistically significant difference between the groups of lacto-ovo-vegetarians, vegans, lacto-vegetarians, and ovo-vegetarians when taking into account age, weight, height, and diet duration (Table 3).

Table 3. **Anthropometric characteristics of the study groups with regard to the types of vegetarian diet**

	Veganism				Lacto-vegetarianism				Lacto-ovo-vegetarianism				Ovo-vegetarianism				P value*
	n	x	SD	Me	n	x	SD	Me	n	x	SD	Me	n	x	SD	Me	
Age (years)	438	25.66	8.39	24.0	105	24.26	7.94	22.0	651	25.91	9.00	24.0	93	25.56	8.7	23.0	0.372
Height (cm)	445	167.85	7.33	167.0	106	167.28	6.92	167.0	655	167.39	6.97	167.0	94	167.45	6.6	167.0	0.728
Weight (kg)	445	61.53	11.76	60.00	105	60.72	13.08	58.0	654	62.27	12.43	60.0	94	60.71	11.8	58.0	0.255
BMI (kg/m^2)	444	21.78	3.50	21.28	105	21.64	4.05	21.19	654	22.16	3.82	21.46	94	21.66	4.2	20.62	0.072
Diet duration (years)	444	5.55	6.24	3.00	104	5.93	5.76	4.0	646	4.99	5.58	3.0	93	4.36	5.1	3.0	0.06

* Kruskal-Wallis rank ANOVA

The majority of the respondents had normal body weight according to the BMI criteria. The average diet duration was 6.18±6.9 years. Statistically significant difference was observed in education (< 0.001) and BMI (< 0.001) (Table 4).

Table 4. **Characteristics of vegetarians (%) with regard to the types of vegetarian diet**

n (%)	Vegans	Lacto-vegetarians	Lacto-ovo-vegetarians	Ovo-vegetarians	P Values*
Sex					
Women	1,165 (87.2)	1,185 (88.7)	1,220 (91.3)	1,265 (94.7)	< 0.001
Men	171 (12.8)	151 (11.3)	116 (8.7)	71 (5.3)	
Education					
Higher	644 (48.2)	580 (43.4)	631 (47.2)	640 (47.9)	< 0.001
Secondary	545 (40.8)	555 (41.5)	545 (40.8)	469 (35.1)	
Vocational	144 (10.8)	151 (11.3)	143 (10.7)	184 (13.8)	
Primary	3 (0.22)	50 (3.77)	17 (1.22)	43 (3.2)	

table continued on the next page

BMI					
Underweight	183 (13.7)	280 (21)	167 (12.5)	214 (16.0)	< 0.001
Normal weight	957 (71.6)	878 (65.7)	938 (70.2)	924 (69.1)	
Overweight	163 (12.2)	140 (10.5)	178 (13.3)	99 (7.4)	
Obesity	33 (2.48)	38 (2.86)	53 (3.98)	99 (7.4)	

* Pearson's χ^2 test

A statistically significant difference was observed in the BOT results. 26.4 % of non-vegetarians and 30.5 % of vegetarians were defined as health food fanatics ($p = 0.01$) (Table 5).

Table 5. **Percentage distribution of the BOT result in both groups, vegetarians and non-vegetarians, as well as intergroup comparisons**

	Vegetarians (%)	Non-Vegetarians (%)	P Value *	P Value **
Healthy participants	69.5	73.0	0.01	0.09
Health fanatics	30.5	26.4		0.21
Participants with orthorexia	0.1	0.6		0.72

* Pearson's χ^2 test; ** structure indicator

A statistically significant difference was also found in the BOT results between the groups following different types of vegetarian diets. The highest score was found in the group of lacto-vegetarians, a lower score among ovo-vegetarians and lacto-ovo-vegetarians, and the lowest score was observed in the vegan group (Table 6). Diet type influenced the BOT results ($p = 0.001$).

Table 6. **Percentage distribution of the BOT result with reference to the types of vegetarian diet and intergroup differences**

	Vegans (%)	Lacto-vegetarians (%)	Lacto-ovo-vegetarians (%)	Ovo-vegetarians (%)	P value *
Healthy participants	72.7	58.5	70.2	66	0.001
Health fanatics	27.3	41.5	29.8	33	
Participants with orthorexia	-	-	-	1	

* Pearson's χ^2 test

A statistically significant difference was revealed in the BOT results concerning diet duration. To be specific, health fanaticism was recognized in 41.7% of participants whose diet lasted up to one year, in 30% of participants whose diet lasted between 1 and 5 years, and in only 21.3% of individuals with a diet lasting over five years. In conclusion, the longer the diet, the lower the BOT scores. This means that the risk for orthorexia nervosa decreases with diet duration (Spearman's $R = -0.26$; $p < 0.001$). Percentage distribution is shown on Figure 2.

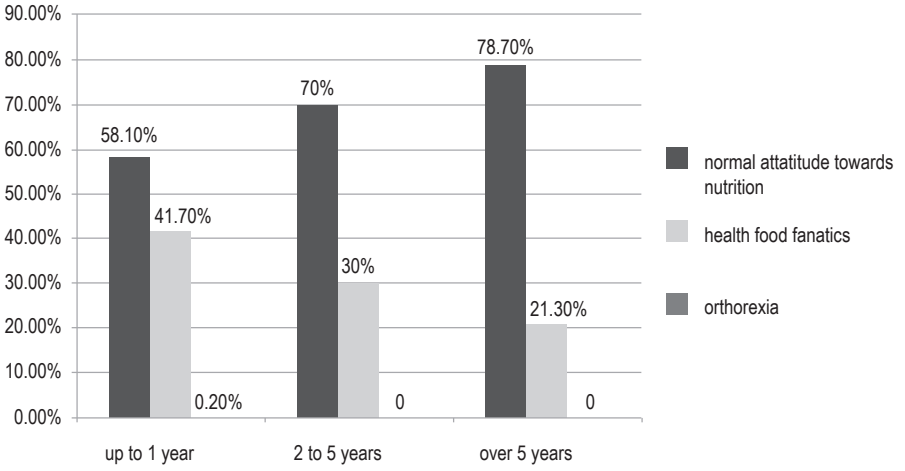

Figure 2. **Results of the BOT depending on the duration (in years) of the diet**

A statistically significant difference was revealed in the BOT results also when it comes to age of the participants. 38.9% of participants under 19 years of age were recognized as health food fanatics. A slightly lower percentage was found in the case of individuals who were between 20 and 24 years of age, and the lowest percentage, namely 21.2 %, among the oldest participants. In conclusion, the more advanced age of the participants, the lower the BOT scores. This indicates that the risk for orthorexia nervosa decreases with age (Figure 3).

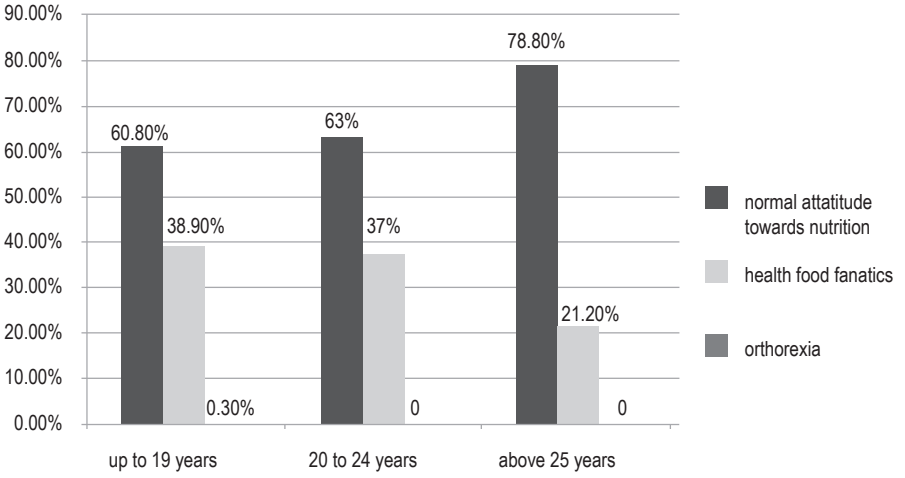

Figure 3. **Results of the BOT depending on age**

This study showed that the prevalence of health food fanaticism among participants with a lower level of education was higher than among highly educated participants. (Figure 4).

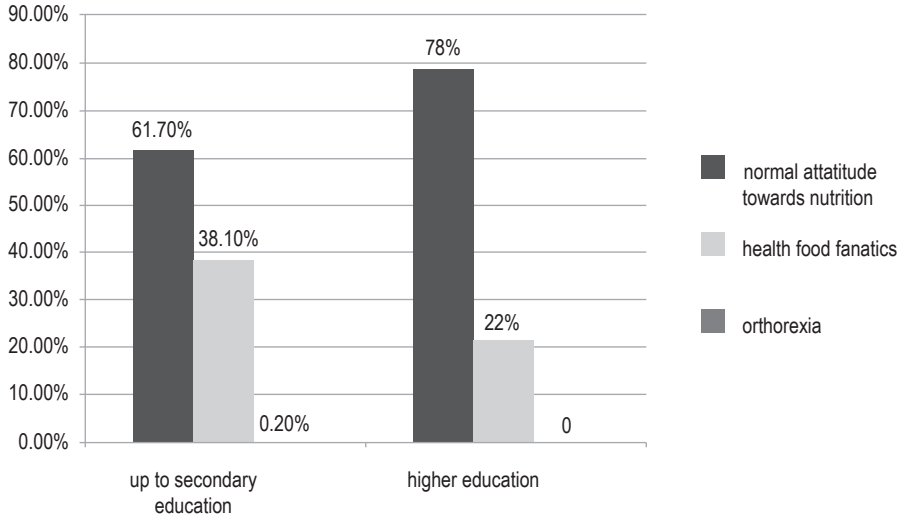

Figure 4. **Results of the BOT depending on the level of education**

Vegetarians (33.3%) were reported to have dietary consultations as frequently as non-vegetarians (34.2%). A statistically significant difference ($p = 0.64$) was not revealed between the groups of vegetarians (33.3%) and non-vegetarians (34.2%).

Discussion

Very few studies can be found on orthorexia nervosa and vegetarianism. However, several studies suggest that eating disorders can affect 17.9% of young women and 6.5% of young men. Among them, 14.6% of women and 5% of men fail to have their eating disorders specified, thus one of them can be orthorexia nervosa [7].

One of the reasons why people decide to be on a vegetarian diet is a desire to improve their health [3]. Individuals suffering from orthorexia have exactly the same goal [7]. One study has shown a case of a boy whose strict vegetarian diet led to his death as a result of cachexia [10]. Steven Bratman described a similar case of a woman who died of cachexia caused by orthorexia nervosa [17].

Some scientists believe that vegetarians are particularly prone to orthorexia nervosa [14, 15]. In addition, it has been suggested by other researchers that vegetarianism can be used to mask eating disorders, as it allows these affected individuals to avoid certain products or situations related to food [18, 19]. In a study by Bardone-Cone et al. [20] who examined participants with both current and past

eating disorders, it was found that vegetarians could see a link between their diet and eating disorder. Following a vegetarian diet allowed them to reduce energy intake, as well as to increase the sense of control. It was also noted that eating disorders occurred more frequently in vegetarians who declared that the reason for following a vegetarian diet was to reduce weight. The conclusions of this study may explain the increased fanaticism of healthy eating observed in people using vegetarian diets for a shorter time.

Vegetarianism is often associated with particular concern for both animals and ecology [5]. Nevertheless, this active involvement of vegetarians in environmental protection may be incomprehensible to people around them, and consequently it may cause social isolation [3]. Vegetarians prefer spending time with people sharing the same ideology [5]. Much the same situation can be observed in the case of people with orthorexia, who feel best among people with similar eating habits [7]. The process of social exclusion may be deepened by avoiding unhealthy meals which, additionally, are prepared by strangers who fail to make them properly [7].

In a study by Donini et al. [21], it was shown that the prevalence of orthorexia nervosa among participants with a lower level of education was higher than among highly educated participants. Similar results were obtained by the authors of this research.

According to Donini et al. [21], orthorexia is more likely to affect older people. However, different results were obtained by Arusoglu et al. [22] who found that orthorexia was not related to age. In our study, vegetarians were found to be more susceptible to orthorexia at young age.

Orthorexia develops gradually as a consequence of self-imposed systematic dietary restrictions [7]. This is also characteristic of vegetarians who first eliminate different kinds of meat, and later fish and sea food. Some of them eventually decide to exclude all forms of animal products [5]. However, in the present study it was noted that lacto-vegetarians and ovo-vegetarians are more likely to develop orthorexia than those excluding all animal products.

Based on the obtained results, health food fanaticism is more specific to vegetarians than non-vegetarians. Obtained results are not sufficient to claim that vegetarian diet is a prone to orthorexia. They also do not indicate that vegetarianism is a way to conceal eating disorders.

It was the first study assessing prevalence of orhorexia among vegetarians. The limitation of the research was the way of data collecting (via the Internet), the strength was the large size of study group. Further studies should be provided with the personal interview. It would be worthwhile also to try to assess the direction of cause and effect on the occurrence of orthorexia nervosa among vegetarians.

Recapitulation

Vegetarians have lower BMI than people who eat meat, more often they are women. The most popular types of vegetarian diet are lacto-ovo-vegetarianis and veganism.

Healthy food fanaticism of is more specific for vegetarians than non-vegetarians. It is more frequent among lacto-vegetarians and ovo-vegetarians than vegans. It is also more strongly expressed in younger, lower-educated people, who apply vegetarianism for a shorter time.

Based on the obtained results, the causal relationship between orthorexia and vegetarianism cannot be determined.

References

1. Mądry E, Walkowiak J, Adamczak-Ratajczak A. *Dieta wegańska – o czym lekarz powinien pamiętać*. Family Medicine & Primary Care Review. 2010; 12(3): 936–938.
2. Mądry E, Walkowiak J, Adamczak-Ratajczak A. *Wegetarianizm – aktualny stan wiedzy*. Family Medicine & Primary Care Review 2010; 12(3): 939–941.
3. Fox N, Ward K. *Health, ethics and environment: A qualitative study of vegetarian motivations*. Appetite. 2008; 50(2–3): 422–429.
4. Hasło *owowegetarianizm*. In: *Słownik języka polskiego PWN*. 2016. http://sjp.pwn.pl/sjp/owowegetarianizmAvailable from: 2570207.html.
5. GellatleyJ.*Viva! Wegetarianizm*. Opole: Vega!POL; 2003.
6. Saddichha S, Babu GN, Chandra P. *Orthorexia nervosa presenting as prodrome of schizophrenia*. Schizophr. Res. 2012; 134(1): 110.
7. Dittfeld A, Koszowska A, Fizia K, Ziora K. *Ortoreksja – nowe zaburzenie odżywiania*. Annales Academiae Medicae Silesiensis. 2013; 67(6): 393–399.
8. Bagci Bosi AT, Camur D, Guler C. *Prevalence of orthorexia nervosa in resident medical doctors in the faculty of medicine (Ankara, Turkey)*. Appetite 2007; 49(3): 661–666.
9. Mathieu J. *What is orthorexia?* J. Am. Diet. Assoc. 2005; 105(10): 1510–1512.
10. Janas-Kozik M, Zejda J, Stochel M, Brożek G, Janas A, Jelonek I. *Orthorexia – a new diagnosis?* Psychiatr. Pol. 2012; 46(3): 441–450.
11. Eriksson L, Baigi A, Marklund B, Lindgren EC. *Social physique anxiety and sociocultural attitudes toward appearance impact on orthorexia test in fitness participants*. Scand. J. Med. Sci. Sports 2008; 18(3): 389–394.
12. Korinth A, Schiess S, Westenhoefer J. *Eating behaviour and eating disorders in students of nutrition sciences*. Public Health Nutr. 2010; 13(1): 32–37.
13. 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 in Clinical Practice 2016; 20(3): 199–203.
14. Catalina Zamora ML, Bote Bonaechea B, García Sánchez F, Ríos Rial B. *Orthorexia nervosa. A new eating behavior disorder?* Actas Esp. Psiquiatri. 2005; 33(1): 66–68.
15. Kummer A, Dias FM, Teixeira AL. *On the concept of orthorexia nervosa*. Scand. J. Med. Sci. Sports 2008; 18(3): 395–396 (author reply 397).
16. WHO Expert Consultation. *Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies*. Lancet 2004; 363(9403): 157–163.
17. Bratman S. *The Authorized Bratman Orthorexia Self-Test*. 2016. http://www.orthorexia.com.

18. Gilbody SM, Kirk SF, Hill AJ. *Vegetarianism in young women: Another means of weight control?* Int. J. Eat. Disord. 1999; 26(1): 87–90.
19. Lindeman M, Stark K, Latvala K. *Vegetarianism and eating-disordered thinking*. Eat. Disord. J. Treat. Prevent. 2000; 8(2): 157–165.
20. Bardone-Cone AM, Fitzsimmons-Craft EE, Harney MB, Maldonado ChR, Lawson MA, Smith R et al. *The inter-relationships between vegetarianism and eating disorders among females*. J. Acad. Nutr. Diet. 2012; 112(8): 1247–1252.
21. 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.
22. Arusoğlu G, Kabakçi E, Köksal G, Merdol TK. *Orthorexia nervosa and adaptation of ORTO-11 into Turkish*. Turk. Psikiyatri Derg. 2008; 19(3): 283–291.

Address: Anna Dittfeld
Chair and Department of Histology and Embryology
School of Medicine with the Division of Dentistry in Zabrze
Medical University of Silesia in Katowice
41-808 Zabrze, Jordana Street 19