

Artículo Original / Original Article

Orthorexic eating behavior and dietary restraint in female undergraduate students

Conducta ortoréxica y restricción dietética en estudiantes universitarias

ABSTRACT

Our objective was to compare the predisposition to orthorexic eating behavior and other eating behaviors between female nutrition and biology undergraduate students in either their first or final year. Ninety-five students participated in this cross-sectional study: 48 nutrition students (1st year - N1 - n= 24; 5th year - N5 - n= 24) and 47 biology students: (1st year - B1 - n= 25; 5th year - B5 - n= 22). The predisposition to orthorexic eating behavior (OEB) was assessed by ORTO-15. The Three-Factor Eating Questionnaire - R21 was used to assess cognitive restriction (CR), emotional eating (EE), and uncontrolled eating (UE). Nutrition students presented a higher predisposition to OEB (85.4% vs 55.3%; $p= 0.001$) and higher scores for CR than biology students (50.3 ± 20.4 vs 38.4 ± 18.8 ; $p= 0.003$), especially first-year students. There was no difference between groups N1 and N5 in any behavior assessed, except for EE (N1: $57.2 \pm 32.5 > N5: 39.8 \pm 19.4$; $p= 0.03$). Our results point to the need for technical training of these students, who will influence the eating habits of other people. In addition, it is necessary to prevent the factors that predispose individuals to extreme eating behaviors, which can eventually harm their physical and emotional health.

Key words: Feeding behavior; Nutrition Disorders; Diet; University Students; Health Occupations.

RESUMEN

Nuestro objetivo fue comparar la predisposición a la conducta ortoréxica y otros comportamientos alimentarios entre estudiantes del sexo femenino de primer y último año de pregrado en nutrición y biología. Se incluyeron 95 estudiantes en este estudio transversal: 48 de nutrición (1° año-N1- n= 24; 5° año-N5-n= 24) y 47 de biología: (1° año-B1-n= 25; 5° año-B5-n= 22). La predisposición a la conducta ortoréxica (CO) fue evaluada por ORTO-15. El Three Factor Eating Questionnaire - R21 fue utilizado para evaluar la restricción cognitiva (RC), el comer emocional (CE) y el comer sin control (CSC). Los estudiantes de nutrición presentaron mayor predisposición a la CO (85,4% vs 55,3%, $p= 0,001$) y mayor puntuación en RC que los de biología ($50,3 \pm 20,4$ vs $38,4 \pm 18,8$; $p= 0,003$), especialmente en el primer año. No hubo diferencias entre los grupos N1 y N5 en ninguno de

Natália de Almeida Marques Lemos¹, Fernanda Rodrigues de Oliveira Penaforte^{2,4}, Ana Elisa Madalena Rinaldi³, Rosa Wanda Diez-García^{1,4}, Camila Cremonesi Japur^{3,4}.

1. Curso de Nutrição e Metabolismo, Faculdade de Medicina, Universidade de São Paulo, Ribeirão Preto, SP, Brasil.
2. Departamento de Nutrição, Instituto de Ciências da Saúde, Universidade Federal do Triângulo Mineiro, Uberaba, MG, Brasil.
3. Curso de Nutrição, Faculdade de Medicina, Universidade Federal de Uberlândia, Uberlândia, MG, Brasil.
4. Laboratório de Práticas e Comportamento Alimentar. Prática, Universidade de São Paulo, Brasil.

Corresponding author: Camila Cremonesi Japur.
Campus Umuarama, Universidade Federal de Uberlândia.
Av. Pará, 1720, Bloco 2U. CEP 38.405-320 Uberlândia- MG.
Telefone: (34) 3225-8584.
E-mail: camila@ufu.br; camijapur@gmail.com

Este trabajo fue recibido el 28 de septiembre de 2018.
Aceptado con modificaciones: 03 de enero de 2018.
Aceptado para ser publicado: 05 de febrero de 2018.

los comportamientos evaluados, excepto para CE (N1: $57,2 \pm 32,5 > N5: 39,8 \pm 19,4$; $p= 0,03$). Nuestros resultados apuntan a la necesidad de capacitación técnica a estos estudiantes, que influirán en los hábitos alimentarios de otras personas. Además, es necesario prevenir los factores que predisponen a los individuos a comportamientos alimentarios extremos, que pueden dañar su salud física y emocional. Palabras clave: Conducta Alimentaria; Trastornos Nutricionales; Dieta; Estudiantes; Empleos en Salud.

INTRODUCTION

Nutrition students and nutritionists have been described as a group at high risk for having eating disorders and disordered eating¹. A disordered eating behavior that has been found in

this group is orthorexia nervosa^{2,3}.

Orthorexia nervosa is defined as an obsession with eating foods considered to be healthy, where an individual has a fixation on eating only healthy foods. This concept is not based only on the nutritional and microbiological composition of the food, but also considers the basic food material, the method of preparation, as well as the utensils and food conservation methods used. In addition, this concept encompasses individuals who are very restricted and demanding of themselves and others⁴, along with those who present specific behaviors, such as a need to have total control of a situation, the search for spirituality in culinary preparations and the identification with groups, for example, vegans, yogis⁵. The presence of this disordered eating is often not detected, because the search for healthy foods is socially accepted and is currently very much encouraged by the media and by health professionals⁶.

Despite having characteristics of an eating disorder and the existence of some proposals in the literature for the definition of diagnostic criteria for orthorexia nervosa^{7,8}, it is still not recognized as a disease by the Diagnostic and Statistical Manual of Mental Disorders - DSM-V⁹ or by the International Statistical Classification of Diseases and Health Related Problems - CID 11¹⁰.

Due to the importance of the topic, the limited literature focusing on orthorexia nervosa, and the fact that nutrition students are a risk group for the development of extreme eating behaviors this study is important. Nutrition students acquire knowledge concerning food composition, suffer pressure from society to maintain a healthy diet, and constantly need to be the "model" for other individuals with respect to health and physical appearance. All these factors can eventually affect eating behaviors in some way: on the one hand, in a positive sense, as healthy foods are being consumed, but on the other, opening the possibility of the development of an obsessive behavior in relation to healthy foods. The possibility therefore arises that the knowledge acquired over the period at the university and the focus on the biomedical model in nutrition courses may contribute toward the exacerbation of this behavior.

We hypothesized that nutrition students would present a higher frequency of acquired dietary restraint and a predisposition to orthorexic eating behavior compared to biology students, and that these characteristics would be more prevalent in students in their final year of studies, compared to first-year students. Therefore, the objective of the study was to compare the predisposition to orthorexic eating behavior and other eating behaviors between female first- and final-year undergraduate nutrition and biology students (intra- and inter-group comparisons).

MATERIALS AND METHODS

This cross-sectional study analyzed female students enrolled in two undergraduate majors at the University of Sao Paulo, Brazil: Nutrition and Metabolism (N) and Biology (B). All female students enrolled in 2014 in the first (Freshmen group – N1 and B1) or fifth/last year (senior group – N5 and B5) of the above-cited majors were invited to participate. We opted to include only female students because these courses are predominantly composed of

female individuals. Students over 45 years of age and/or with any diagnosis of chronic disease were excluded.

The recruitment occurred at the beginning of the first semester of 2014; at the start of their studies, students had not been subject to any influence from university life or academic knowledge, and those from the fifth year were beginning their last year, which would culminate in their graduation, without having started their internships. This study used convenience sampling. The final sample was composed of all those who consented to participate in the study. The participation rate was 100% (24/24) in N1, 68.5% (24/35) in N5, 71.5% (25/35) in B1, and 92% (22/24) in B5.

The Ethics Committee for Research Involving Human Subjects approved this study (Working Document 520.003/2014), and all students read and signed the informed consent form. After signing the informed consent and before the application of the questionnaires, students were instructed on how they should complete the questionnaires and were given 10 to 20 minutes to fill them out. All the questionnaires were numbered so the students would not feel intimidated while filling them out. Furthermore, anthropometric measurements were taken.

Sample characterization

Age, marital status, and life habits (smoking, regular exercise, and regular use of diets aimed at losing weight – described here as dieting) were assessed. Nutritional status was classified by Body Mass Index (BMI)^{11,12}. Weight and height were measured using standardized methods¹³.

Assessment of predisposition to orthorexic eating behavior

The proposal underlying the questionnaire ORTO-15 is to identify the frequency of orthorexia nervosa. The questionnaire, originally from Italy, was created and validated by Donini et al.^{14,15}, translated to Portuguese and adapted to the Brazilian culture by Pontes et al.¹⁶. Each question has four answer options (always, many times, few times, never) scored from 1 to 4. The total score can vary between 15 and 60 points. Predisposition to orthorexic eating behavior was established when total score was less than 40 points^{15,16}.

Assessment of eating behaviors

The application of the Three-Factor Eating Questionnaire - R21 allows for the assessment of three different eating behaviors: 1. Cognitive restriction (CR- 6 items), characterized by a set of eating behaviors that involve obligations and prohibitions, aimed at reducing the caloric intake, and consequently, maintaining or losing weight (dietary restraint); 2. Emotional eating (EE- 6 items), which refers to the influence of self-esteem, mood, stress, and self-efficacy in food intake; and 3. Uncontrolled eating (UE- 9 items), which indicates a loss of self-control and exaggerated food intake, with or without hunger or organic necessity^{17,18}. This questionnaire is composed of 21 questions, and it was translated to Portuguese and validated^{19,20}. The total score from each behavior (score of 0 to 100) was calculated

using methods previously described^{17,21}. Higher scores indicate more restraint, emotional and uncontrolled eating.

Statistical Analysis

The normality of the variables was tested using the Shapiro-Wilk test. Categorical variables –nutritional status, marital status, dieting, physical exercise practice, and predisposition to orthorexic eating behavior– were described using relative frequency. BMI and age using the median and interquartile range (Q1;Q3), and the score for the variables that characterize eating behaviors – cognitive restriction, emotional eating, and uncontrolled eating – were described using the average and standard deviation.

Comparisons between courses (nutrition and biology) and years (1st year and 5th year), and between the years within each course, was performed using chi-square tests. The BMI and age comparison was performed using the Kruskal-Wallis test. The comparison of the average values of the variables characterizing eating behavior – cognitive restriction and emotional and uncontrolled eating – between the courses and years, and the years within each course, was performed using the student's t-test. The significance level adopted was 5%. All analyses were performed using Stata 12.0 SE.

RESULTS

Sample characterization

Ninety-five female students were evaluated, 48 nutrition students (24 from the first year – N1 and 24 from the fifth year – N5) and 47 biology students (25 from the first year – B1 and 22 from the fifth year – B5). The median (Q1;Q3) age was 21 (19;24) years for nutrition students, which was

higher than age of biology students-20 (18;21) years ($p=0.01$). In the sample, 96.8% were single and 3.2% were in a stable relationship. BMI was similar between individuals in the two majors – nutrition: 21.0 (19.8;23.9) kg/m² and biology: 21.8 (20.4;24.4) kg/m², $p=0.11$. The majority of students were normal weight, and none were smokers. There was no statistical difference between the groups in relation to nutritional status (underweight, normal weight, overweight or obese). Nutrition students reported higher physical activity compared to biology students (68.7% vs 46.8%; $p=0.03$). However, comparing first and fifth year students within the same major and between the courses (first and fifth year), their frequency was similar. There was no statistical difference between the groups in relation to dieting, except N1, which presented higher percentages of dieting than B1 (66.7% vs 36.0%; $p=0.03$) (Table 1).

Orthorexic eating behavior

Nutrition students presented higher frequency of predisposition to orthorexic eating behavior compared to biology students (85.4% vs 55.3%; $p=0.001$). Among first-year students, N1 students presented higher frequency of this behavior compared to B1 students (83.3% vs 48.0%; $p=0.01$) (Table 2).

Eating behaviors

Nutrition students presented higher scores than biology students for cognitive restriction (50.3 ± 20.4 vs 38.4 ± 18.8; $p=0.003$). This behavior was more evident in group N1 when compared to B1 (55.5 ± 17.4 vs 32.4 ± 16.1; $p<0.001$), and in group B5 when compared to B1 (45.2 ± 19.7

Table 1. Nutritional status, and self-report of dieting, physical activity and smoking among nutrition and biology students.

	Groups					
	N1 (n=24)	N5 (n=24)	Total (n=48)	B1 (n=25)	B5 (n=22)	Total (n=47)
BMI (kg/m ²) ¹	20.6 (19.8;23.8)	21.6 (19.9;23.9)	21.0 (20.0;24.0)	21.5 (20.0;23.7)	22.5 (21.1;24.4)	21.8 (20.4;24.4)
Underweight (%)	8.3	12.5	10.4	8.0	0	4.3
Normal weight (%)	75.0	70.8	72.9	72.0	81.8	76.6
Overweight (%)	12.5	16.6	14.6	20.0	9.1	14.9
Obese (%)	4.2	0	2.1	0	9.1	4.3
Dieting (%)	66.7*	41.7	54.2	36.0*	45.4	40.4
Physical activity (%)	62.5	75.0	68.7*	40.0	54.5	46.8*
Smokers (%)	0.0	0.0	0.0	0.0	0.0	0.0

BMI: body mass index; N1: first-year nutrition students; N5: fifth-year nutrition students; B1: first-year biology students; B5: fifth-year biology students.
¹Median (Q1: first quartile; Q3: third quartile).
Differences between the groups expressed by * $p<0.05$.

vs 32.4 ± 16.1 ; $p < 0.05$). In regard to emotional eating, N1 students presented higher score than N5 students (57.2 ± 32.5 vs 39.8 ± 19.4 ; $p < 0.05$). As to uncontrolled eating, no statistical differences were found between groups (Table 2).

DISCUSSION

Undergraduate nutrition students had a higher predisposition to develop orthorexic eating behavior and dietary restraint compared to biology students. When the first-year students were compared, students majoring in nutrition presented a higher frequency of predisposition to orthorexic eating behavior and cognitive restriction, and self-reported more dieting compared to the biology students, while those in their final year showed no difference between the groups.

Similar results were found in a Swedish study that showed a higher predisposition to orthorexic eating behavior, evaluated by ORTO-15, in exercise science students compared to business students (84.5% vs 65.4%; $p = 0.002$). These results reaffirm the idea that students enrolled in health and body-related courses seem to have a greater susceptibility to the development of orthorexic eating behavior²². However, another study, conducted with German students, did not find any difference between nutrition students and students in other majors with regard to orthorexic eating behaviour²³.

The higher frequency of predisposition to orthorexic eating behavior in nutrition students can be explained by the social pressure to eat adequately and to be a model of healthy eating. Healthy eating does not consist only of eating food with great nutritional composition, it is important to consider

other factors, such as family, culture, religion, environment, economy, as well as previous personal experience²⁴. It is common to hear reports of surprise or even demands from family and friends when a nutrition student or nutritionist presents food habits that are not deemed as extremely adequate from a nutritional point of view²⁵. Another relevant factor is that society frequently evaluates the work of nutritionists by their physical appearance and individual food choices, and not for their technical competence^{24,26,27,28}. This social pressure can increase their predisposition to orthorexic eating behavior and eating disorders^{24,27,29}.

Magalhães & Mota³⁰, observed, in a study with 64 first-year nutrition students, that there was an expectation of acquiring knowledge, throughout the course, regarding weight loss and health improvements, and that study would be the vehicle to finding the possible "miracle" of the ideal diet for weight loss. This findings can help to explain the higher predisposition to orthorexic eating behavior, dietary restraint and self-reported dieting in first-year nutrition students.

First-year nutrition students (N1) presented a similar frequency of predisposition to orthorexic eating behavior as those in their last year (N5). Previous studies with Brazilian students from both technical²⁶ and undergraduate courses^{3,31} in nutrition have shown similar results. Our results show how important the discussion of the academic formation of nutritionists is. A study by Santos³² revealed that the practice of nutritional education is still focused on the transmission of knowledge concerning nutrients, and does not consider social and emotional influences. This bias can be a consequence

Table 2. Predisposition to orthorexic eating behavior, and cognitive restriction, emotional eating, and uncontrolled eating scores in nutrition and biology students.

	Groups					
	N1 (n=24)	Nutrition N5 (n=24)	Total (n=48)	Biology B1 (n=25)	B5 (n=22)	Total (n=47)
Predisposition to orthorexic eating behavior (%)	83.3 [¥]	87.5 [£]	85.4 ^δ	48.0 [¥]	63.6 [£]	55.3 ^δ
ORTO-15 score ¹	36.0 [¥] (32.5; 39.0)	36.0 [£] (32.5; 38.0)	36.0 ^δ (32.5; 39.0)	40.0 [¥] (38.0; 41.0)	38.0 [£] (36.0; 42.0)	39.0 ^δ (37.0; 41.0)
Cognitive Restriction	55.5 ± 17.4 ^δ	45.1 ± 22.1	50.3 ± 20.4 [¥]	32.4 ± 16.1 ^{δ*}	45.2 ± 19.7 [*]	38.4 ± 18.8 [¥]
Emotional Eating	57.2 ± 32.5 [*]	39.8 ± 19.4 [*]	48.5 ± 27.9	48.4 ± 29.0	41.2 ± 21.1	45.0 ± 25.6
Uncontrolled Eating	41.2 ± 18.9	36.3 ± 16.6	38.7 ± 17.8	42.5 ± 13.2	41.6 ± 10.6	42.1 ± 12.0

N1: first-year nutrition students; N5: fifth-year nutrition students; B1: first-year biology students; B5: fifth-year biology students.
¹Median (Q1: first quartile; Q3: third quartile).
 Identical letters on the same line means statistical difference between the groups, expressed by: * = $p < 0.05$; ¥, £ = $p < 0.01$; δ = $p < 0.001$.

of an academic formation that reinforces the personal and professional beliefs of nutritionists regarding dieting and dietary restraint, considering nutrient and calorie content only for the client.

This same bias was observed in the comparison of cognitive restriction among groups, which was higher in nutrition students compared to biology students, mainly for first-year students, similar to previous studies^{23,33}. Food restrictions and dieting are strategies commonly used for weight loss. People who follow diets, especially with restrictions on highly palatable foods, present irritability, anxiety, apathy, and lethargy³⁴. Thus, at the end of a restrictive period, which is often related to an emotional response, there is a tendency for uncontrolled and binge eating episodes. It is also common that the obsession directed towards foods that were prohibited and their excessive intake can lead to feelings of weakness, low self-efficacy, and low self-esteem in the individual³⁵.

Although among individuals considered restrained eaters it is common to find episodes of uncontrolled eating, no difference was found between the groups in the present study. These findings suggest that while cognitive restriction characterized by dieting is associated with healthy eating and the search for a thin, athletic body – practices that are in fact accepted and valued by society – uncontrolled eating is considered a deplorable behavior, as it is associated with a lack of control, and thus, weakness.

An important limitation of studies about orthorexia nervosa is the lack of a gold standard method or recognized criteria for its diagnosis. In light of this absence, instruments such as ORTO-15 are used, which are based on individual self-report. This can result in the overestimation of orthorexic eating behavior, because an individual with a dietary restraint over a limited time period or following a specific ideology, such as yogis or vegans, can be characterized as orthorexic^{6,36}. Nutrition students can also be considered as a possible bias group, because they develop higher concern about eating that is not necessarily pathological. Taking such limiting factors into consideration, the decision was reached not to present the results as showing a prevalence of orthorexia nervosa, but as a predisposition to orthorexic eating behavior. Another important point is that this study was cross-sectional; it would be interesting to perform a longitudinal analysis involving the same students from the start to the end of the major in order to evaluate whether the results are maintained. This study was carried out with students from a public university from southeast Brazil, and hence, these results cannot be generalized to other regions of the country or to nutrition students from other countries and cultures.

CONCLUSION

Nutrition students presented a greater predisposition to orthorexic eating behavior and dietary restraints compared to biology students. Our most important finding is that there was a higher predisposition to orthorexic eating behavior

and dietary restraint among the first-year nutrition students compared to the first-year biology students. Our results serve as a warning of the importance of working on the technical training of these students, who will influence the eating habits of other people. In addition, it is necessary to create strategies for the prevention and control of the factors that predispose individuals to extreme eating behaviors, which can eventually harm the physical and emotional health of nutrition students.

Acknowledgments

We gratefully acknowledge the National Council of Scientific and Technological Development (CNPq) for scholarship.

The authors declare that they have no conflicts of interest. All authors contributed to this paper. NAM Lemos have made an active contribution to the collection of data, and analysis and interpretation of the data and the drafting of the paper. AEM Rinaldi & RW Diez-Garcia have made an active contribution to the analysis and interpretation of the data and the drafting of the paper. FRO Penaforte & CC Japur have made an active contribution to the conception and design, and analysis and interpretation of the data and the drafting of the paper. All authors critically reviewed the manuscript and approved the final version submitted for publication.

REFERENCES

1. Mahn HM, Lordly D. A Review of Eating Disorders and Disordered Eating amongst Nutrition Students and Dietetic Professionals. *Can J Diet Pract Res* 2015; 76(1): 38-43. doi:10.3148/cjdp-2014-031.
2. Alvarenga MS, Martins MCT, Sato KSCJ, Vargas SVA, Philippi ST, Scagliusi FB. Orthorexia nervosa behavior in a sample of Brazilian dietitians assessed by the Portuguese version of ORTO-15. *Eat Weight Disord*. 2012; 17(1):e29-35. <http://www.ncbi.nlm.nih.gov/pubmed/22751269>.
3. Souza QJOV de, Rodrigues AM, Souza QJOV de, Rodrigues AM. Risk behavior for orthorexia nervosa in nutrition students. *J Bras Psiquiatr* 2014; 63(3): 200-204. doi:10.1590/0047-2085000000026.
4. Bratman S. *Health Food Junkies : Overcoming the Obsession with Healthful Eating*. Broadway Books; 2000.
5. Muñoz Sánchez R, Moreno AM. Orthorexia and vigorexia: are they new eating disorders? *Trastornos de la Conducta Alimentaria* 2007; 457-482. http://www.tcsevilla.com/archivos/ortorexia_y_vigorexia.pdf.
6. Koven NS, Abry AW. The clinical basis of orthorexia nervosa: emerging perspectives. *Neuropsychiatr Dis Treat*. 2015;11: 385-394. doi:10.2147/NDT.S61665.
7. Moroze RM, Dunn TM, Craig Holland J, Yager J, Weintraub P. Microthinking about micronutrients: a case of transition from obsessions about healthy eating to near-fatal "orthorexia nervosa" and proposed diagnostic criteria. *Psychosomatics*. 2014, 56(4): 397-403. doi:10.1016/j.psym.2014.03.003.
8. Dunn TM, Bratman S. On orthorexia nervosa: A review of the literature and proposed diagnostic criteria. *Eat Behav*. 2016; 21: 11-17. doi:10.1016/j.eatbeh.2015.12.006.
9. American Psychiatric Association. *DSM-5 Task Force. Diagnostic and Statistical Manual of Mental Disorders: DSM-5*. American Psychiatric Association; 2013.

10. WHO. *International Classification of Diseases*. WHO. 2017. <http://www.who.int/classifications/icd/en/>.
11. WHO Expert Committee. WHO. *Physical Status: The Use and Interpretation of Anthropometry*. Technical Report Series No. 854. Geneva: World Health Organization; 1995. http://www.who.int/childgrowth/publications/physical_status/en/.
12. de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ* 2007; 85(9): 660-667. <http://www.ncbi.nlm.nih.gov/pubmed/18026621>.
13. Lohman TG, Roche AF, Martorell R. *Anthropometric Standardization Reference Manual*. Human Kinetics Books; 1988. https://books.google.com.br/books/about/Anthropometric_Standardization_Reference.html?id=jjGAAAAAMAAJ&redir_esc=y.
14. 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. <http://www.ncbi.nlm.nih.gov/pubmed/15330084>.
15. Donini LM, Marsili D, Graziani MP, Imbriale M, Cannella C. Orthorexia nervosa: validation of a diagnosis questionnaire. *Eat Weight Disord*. 2005; 10(2):e28-32. <http://www.ncbi.nlm.nih.gov/pubmed/16682853>.
16. Pontes JB, Montagner MI, Montagner MÂ. Orthorexia nervosa: cultural adaptation of ortho-15. *DEMETERA Aliment Nutr Saúde* 2014; 9(2): 533-548. doi:10.12957/demetra.2014.8576.
17. Stunkard AJ, Messick S. The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *J Psychosom Res* 1985; 29(1): 71-83. <http://www.ncbi.nlm.nih.gov/pubmed/3981480>.
18. de Lauzon B, Romon M, Deschamps V, et al. The Three-Factor Eating Questionnaire-R18 is able to distinguish among different eating patterns in a general population. *J Nutr* 2004; 134(9): 2372-2380. <http://www.ncbi.nlm.nih.gov/pubmed/15333731>.
19. Natacci LC, Ferreira Júnior M. The three factor eating questionnaire - R21: tradução para o português e aplicação em mulheres brasileiras. *Rev Nutr* 2011; 24(3): 383-394. doi:10.1590/S1415-52732011000300002.
20. de Medeiros ACQ, Yamamoto ME, Pedrosa LFC, Hutz CS. The Brazilian version of the three-factor eating questionnaire-R21: psychometric evaluation and scoring pattern. *Eat Weight Disord - Stud Anorexia, Bulim Obes* 2017; 22(1): 169-175. doi:10.1007/s40519-016-0256-x.
21. Karlsson J, Persson LO, Sjöström L, Sullivan M. Psychometric properties and factor structure of the Three-Factor Eating Questionnaire (TFEQ) in obese men and women. Results from the Swedish Obese Subjects (SOS) study. *Int J Obes Relat Metab Disord* 2000;24(12): 1715-1725. <http://www.ncbi.nlm.nih.gov/pubmed/11126230>.
22. Malmberg J, Bremander A, Olsson MC, Bergman S. Health status, physical activity, and orthorexia nervosa: A comparison between exercise science students and business students. *Appetite* 2017; 109: 137-143. doi:10.1016/j.appet.2016.11.028.
23. Korinth A, Schiess S, Westenhoefer J. Eating behaviour and eating disorders in students of nutrition sciences. *Public Health Nutr* 2010; 13(1): 32. doi:10.1017/S1368980009005709.
24. Martins MCT, Alvarenga M dos S, Vargas SVA, Sato KSC de J, Scagliusi FB. Orthorexia nervosa: reflections about a new concept. *Rev Nutr* 2011; 24(2): 345-357. doi:10.1590/S1415-52732011000200015.
25. Monteiro MRP, Andrade MLO, Zanirati VF, Silva RR. Eating habits and intake of female students of nutrition and nursing in a Brazilian public university. *Rev APS* 2009; 12(3): 271-277. <http://bases.bireme.br/cgi-bin/wxislind.exe/iah/online/?IscScript=iah/iah.xis&src=google&base=LILACS&lang=p&nextAction=lnk&exprSearch=555349&indexSearch=ID>.
26. Pontes JB. Orthorexia in nutrition students: overcorrection adopted in professionals habits. 2012. http://www.scielo.br/scielo.php?script=sci_nlinks&pid=S0047-2085201400030020000008&lng=en. Accessed April 21, 2017.
27. Fiates GMR, Salles RK de. Risk factors in the development of eating disorders: study in a group of college women. *Rev Nutr* 2001; 14: 3-6. doi:10.1590/S1415-52732001000400001.
28. Araújo KL de, Pena PGL, Freitas M do CS de, et al. Stigma of obese dietitians in the work world. *Rev Nutr* 2015; 28(6): 569-579. doi:10.1590/1415-52732015000600001.
29. Silva JD, Silva AB de J, Oliveira AVK de, Nemer AS de A. Influence of the nutritional status in the risk of eating disorders among female university students of nutrition: eating patterns and nutritional status. *Cien Saude Colet* 2012; 17(12): 3399-3406. doi:10.1590/S1413-81232012001200024.
30. Magalhães P, Motta DG da, Motta DG da. A psychosocial approach on the nutritional status and dietary behavior among students of Nutrition Sciences. *Nutr Rev Soc Bras Aliment Nutr* 2012; 37(2): 118-132. doi:10.4322/nutrire.2012.010.
31. Penaforte FRO, Barroso SM, Araújo ME, Japur CC. Orthorexia nervosa in nutrition students: association with nutritional status, body satisfaction and coursed period. *J Bras Psiquiatr*. 2018; in press.
32. Santos LA da S. Practical food and nutrition education: some points for reflection. *Cien Saude Colet* 2012; 17(2): 561-563. doi:10.1590/S1413-81232012000200029.
33. Poínhos R, Alves D, Vieira E, Pinhão S, Oliveira BMPM, Correia F. Eating behaviour among undergraduate students. Comparing nutrition students with other courses. *Appetite*. 2015; 84: 28-33. doi:10.1016/j.appet.2014.09.011.
34. Polivy J. Psychological Consequences of Food Restriction. *J Am Diet Assoc* 1996; 96(6): 589-592. doi:10.1016/S0002-8223(96)00161-7.
35. Polivy J, Coleman J, Herman CP. The effect of deprivation on food cravings and eating behavior in restrained and unrestrained eaters. *Int J Eat Disord* 2005; 38(4): 301-309. doi:10.1002/eat.20195.
36. Håman L, Barker-Rucht N, Patriksson G, Lindgren E-C. Orthorexia nervosa: An integrative literature review of a lifestyle syndrome. *Int J Qual Stud Health Well-being* 2015; 10: 267-299. doi:10.3402/qhw.v10.26799.