

# Prevalence of Orthorexia Nervosa Among Nutrition Students and Nutritionists in Jordan: Pilot Study

**Mai Adnan ABDULLAH**

Al-Balqa' Applied University Al Huson University College

**Huda Mustafa Al-Hourani**

The Hashemite University

**Buthaina Alkhatib** (✉ [buthaynamk85@yahoo.com](mailto:buthaynamk85@yahoo.com))

The University of Jordan School of Agriculture <https://orcid.org/0000-0002-6105-0680>

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## Research article

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# Abstract

**Objective:** Orthorexia Nervosa (ON) is defined as an excessive concern in choosing and preparing of meals according to strict rules. The aim of this study was evaluating the threat of orthorexia in a group of students and nutritionists and the tendency toward the presentation of ON behavior

**Methods:** This cross-sectional study was carried out in July and August of 2019 among 421 nutrition students from six universities, in addition to nutritionists in Jordan. Participants completed questionnaire related to individual characteristics and the ORTO-15 scale. Orthorexia Nervosa (ON) tendency was measured using ORTO-15 questionnaire, referring to different diagnostic thresholds (40/35).  $P < 0.05$  was accepted as statistically significant.

**Results:** Orthorexia had 72.0% prevalence in our sample using the 40-point threshold; the figure was reasonably lower with the 35-point threshold (31.8%). Also, ON tendency was significantly affected by BMI categories ( $p=0.007$ ) and gender ( $p=0.043$ ) at 35-point threshold. Males have more tendency (39.4%) than females (28.6%) ( $p=0.029$ )

**Conclusion:** The results of this study highlight the magnitude of ON in Jordan. Using cut-off at 35 is preferable than cut-off at 40 to identify factors influencing ON. Moreover, ON tendency is affected by gender and BMI and not affected by educational level.

## Summery

- Orthorexia Nervosa was first introduced by Steven Bratman, in 1997.
- It describes a combination of eating related behaviors such as fixation of healthy proper nutrition and eats pure foods.
- In extreme cases, the obsessive-compulsive characteristics of ON become pathological and controlled a person's life.
- Most prevalence studies for ON report rates from 30% to 70%.
- The results of this study highlight the magnitude of ON in Jordan. Using cut-off at 35 is preferable than cut-off at 40 to identify external factors influencing ON.
- Orthorexia had 72.0% prevalence in our sample using the 40-point threshold; the figure was reasonably lower with the 35-point threshold (31.8%).
- However, ON tendency is affected by gender and BMI, it is not affected by educational level.

## 1. Introduction

A newly diagnosed qualitative pathological non-formal eating disorder known as orthorexia nervosa (ON) is currently grabbing the attention of the researchers ([1, 2]. It was first introduced by Steven Bratman, in 1997 [3] as obsessive eating disorder toward purity and perfection. The term ON was derived from Greek words; ortho (proper or accurate or correct or right) and orexia (appetite or hunger) [4, 5]. It describes a

combination of eating related behaviors such as fixation of healthy proper nutrition and eats pure foods [6]. Over the time, individuals with ON improves dietary restriction or food groups omission and eventually nutritional deficiencies [7–9].

ON is not a weight loss diet, it described as a harmful behavior connected with to phobia about eating only pure foods; tendency to exclude foods in fear of hormones, pesticides, or genetically modified foods, other focus concentrate on preparation materials and methods, or worries about animal diseases like avian flu and mad cow, to improve their health or to treat a health problem [10, 11].

In extreme cases, the obsessive-compulsive characteristics of ON become pathological and controlled a person's life [4]. Due to obsessive omission of some essential food groups or items, the consequences may exhibit nutritional deficiencies among orthorexic individuals [6]. Furthermore, it will lead to loss of quality of life and social relationship [8]. More and more clinical studies related to ON have increased as it becomes more familiar to health care professionals [2], but until 2016, it was neither classified formally in Classification of Mental and Behavioral Disorders (ICD-10) nor in Diagnostic and Statistical Manual of Mental Disorders (DSM–5) [12].

Opposite to ON, the main features of eating disorders like anorexia and bulimia nervosa are fears of gaining weight, focus on food quantity, common in females and they are concern about body image disturbances [13].

For ON diagnosis, Bratman and Knight describe a 10 items questionnaire in a yes/no format to identify and diagnose those at risk for ON called Bratman Orthorexia Test (BOT) [4]. Attempts have been made based on BOT, by Donini and colleagues who developed "ORTO-15," a designed instrument to detect ON [9, 14]. Donini and colleagues were expanded the scoring to a 1 to 4 scale (always, often, sometimes, never) regarding dietary habits food preference, where the scores range between 15 as a minimum score and 60 as a maximum score [15]. However, lower scores indicate more extreme dieting practices [9]. Moreover, they proposed a cut-off point to differentiate between individuals with or without ON [5]. Until 2019, ORTO-15 becomes the most psychometric tool; it was used in 49 studies [13].

The prevalence of ON regularly reported by community or university samples, it varies from 6% as in Italian study [9] to 88.7% as in Brazilian female nutritionists [16]. Most prevalence studies for ON report rates from 30–70% [14]. Tremelling and his colleagues were examined the symptoms of ON and eating disorders among a sample of registered dietitian nutritionists in the United States, the score on the ORTO-15 suggested 49.5% were at risk of ON, and 12.9% were at risk of eating disorders [17]. Moreover, in Selangor, according to a study done by ab Hamid et al. (2018) to assess the prevalence of ON and the quality of life among health sciences students, 67.4% of the students had the tendency to experience ON. The results of the correlational analysis showed no correlation between ON and quality of life ( $r < 0.29$ ) [18]. In Turkey, there were four studies interested in ON, the prevalence rate among selected groups ranged from 45.5% (2007); 56.4% (2009); 43.6% (2010); to 41.9% (2015) [7, 19–21]. As ON possess a global problem spread among health science students, graduates, athletes and artists, furthermore, up to our knowledge, there is only a single study looking for the prevalence of ON in Arab countries, in Lebanon

[22]; the result was alarming as the prevalence of ON was 75.2%. It is necessary to conduct a ON prevalence assessment studies in other Arab regions. Jordan is home to eight public and private universities offering the nutrition and dietetic specialty since 1979, Therefore, this study aimed to determine the prevalence of ON among nutrition students and nutritionists in Jordan.

## 2. Materials And Methods

### 2.1 Participants

This cross-sectional study was conducted over the period July-Aug 2019. A total of 421 voluntary participants (127 males and 294 females) from six universities in Jordan (307 undergraduate students of Nutrition and Dietetics, 82 postgraduate students, 32 graduates and nutritionists). Participants received an emailed research questionnaire, and they were given an informed consent form before assessment began. In addition, nutritionists who are unable to read English, those who have chronic diseases such as diabetes or heart diseases, female participants who were currently pregnant, breastfeeding were all excluded. The ethical aspects of the present study are included in the Declaration of Helsinki.

### 2.2 Sociodemographic data

The first part of the questionnaire was covered the socio-demographic data including participant's age, gender, educational attainment, occupation, height, weight, and behavior concerning smoking. Body mass index (BMI, kg/m<sup>2</sup>) of participants was calculated from participants' self-reported height and weight using the World Health Organization's BMI classification (World Health Organization, 2006). According to this classification, participants with a BMI <18.5 (underweight), those with BMI ranging from 18.5 to 24.9 (normal weight), those with 25.0-29.9 (overweight), those with BMI ≥30.0 (obese).

### 2.3 Instruments

The second part of the questionnaire we used ORTO-15, which is a validated self-administer questionnaire which was developed by Donini *et al.* (2005) to measure the risk of ON based on a group of questions that design to investigate the obsessive response of entities of selected samples in selecting, purchasing, preparing and consuming food. ORTO-15 consists of 15 questions with Likert-scale response categories (always, often, sometimes, never) ranging from 1-associated with ON, to 4-associated with normal eating behavior (Table 1). A total score was calculated by summing the responses to each of the 15 questions. According to Donini *et al.* (2005), a high risk of ON is seen as a score below or equal 40 scores, while according to Ramacciotti *et al.* (2011); a cut-off at <35 provides a lower and more accurate estimate of ON tendency, than the cut-off at <40. Both cut-offs were used in our study.

### 2.4 Statistical Analysis

Analyses of obtained data were carried out using SPSS software (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). Categorical variables were described using percentages. The chi-

square test was used to compare percentages. Multivariate Analysis of Variance (MANOVA) test was used to study the association between the variables and the presence of Orthorexia, where the dependent variable was the ORTO-15 at two levels (35 and >40 cut off point), and the independent variables were the both genders (male and female) and the BMI at four levels. Kruskal-Wallis test was used to evaluate the difference in continuous variables between the groups. A  $p$ -value of <0.05 was considered statistically significant.

## 3. Results

### 3.1 Socio-demographic characteristics of the sample

Of the study population, 100% of participated subjects completed and returned the structures questionnaire. The characteristics of the sample are presented in Table 2. The sample included 421 participants, of which 294 were females and 127 were males. The highest number of participants was on age group (18-22) 58.9%. Majority of the participants were single (83.5%), with no experience (78%) and in normal body weight category (64.3%). More participants were enrolled in bachelor students (73.1%) than in BSc. holder (19.5%) and postgraduate (7.5%). Almost a half of the participants were non-smokers (57.3%).

### 3.2 Orthorexia nervosa tendency across gender

The ON tendency was observed among 72.0% of the total sample when fixing the cut-off at 40-point threshold. However, only 31.8% of participants showed ON tendency when the cut-off at 35-point threshold was implemented. There were no significant differences in ON tendency between gender groups at cut-off 40-point threshold. On the other hand, it was significant at 35- point threshold; ON tendency for males and females were 39.4% and 28.6; respectively ( $p=0.029$ ) (Table 3).

### 3.3 Orthorexia nervosa tendency and BMI categories

Depending on cut-off at 35-point threshold, the differences between BMI categories were significantly observed (0.007); as the BMI was increased from underweight to obese participants, the ON tendency was significantly gradually increased. ON tendency was 15.2%, 30.5%, 35.5% and 55.2% for underweight, normal weight, overweight and obese; respectively. Also, the ON tendency was higher on all BMI categories (ranges from 70.3-82.8%) when depending on the cut-off at 40-point threshold, without significant differences between BMI categories (Table 4).

### 3.4 Test on Confounding effect of BMI and Gender Variables on ON tendency

As shown in Table 5, there was a statistically significant effect of gender  $F(2, 389) = 3.172, p = 0.043$ ; Wilks'  $\Lambda = 0.984$ . However, there was no statistically significant interaction effect between gender and BMI on the combined different scoring methods of ON (Table 5).

With regard to the BMI as main effect, it can be seen from the data of MANOVA in Table 5 that, the BMI reported insignificantly among the four levels ( $F(4, 389) = 1.480, p = 0.182$ , and Wilks'  $\Lambda = 0.978$ ). Moreover, the in-between gender and BMI effect is insignificant  $F(6, 389) = 1.737, p = 0.109$ , Wilks'  $\Lambda = 0.974$ . Positive high correlation is reported for the effect of two variables, but gender main effect is reported to have a significant correlation as shown in table 5.

Table 6 shows the results of MANOVA that used to test the independent variables (the gender and BMI), on the Ortho-15 results at the two cut point levels (35/>40). There were significant differences between gender (0.043) and Ortho-15 cut off point, however there is no significant differences reported between the BMI the two cut-off point levels of Ortho-15. The in-between Gender and BMI shows insignificant differences ( $p < 0.109$ ).

### **3.5 Relationship between Orthorexia nervosa tendency and educational level**

Regarding the educational level, when the cut-off at 40-point threshold was used, the ON tendency was 73.0%; 71.6%, and 61.3 % for students; BSc. holders and postgraduate; respectively (Table 7). However, the ON tendency was decreased by about 2.5 folds for all educational categories at cut-off at 35-point threshold as compared to cut-off 40-point threshold.

## **4. Discussion**

Despite limited research in Orthorexia Nervosa and nutrition and dietetic students, some promising strides have been made in the way of examining those students in the health sciences and Orthorexic behaviors. Orthorexia nervosa is a recently recognized as eating disorder, where the quality of food becomes an obsession, and it is characterized by highly worries about healthy nutrition and eating attitudes. The current study was attempted to evaluate the prevalence of ON among students and nutritionist in Jordan. To the best of our knowledge, this study was the first to address ON among Jordanian nutrition students and nutritionists.

Few researchers have examined nutrition and dietetic students' incidence of Orthorexia. The results obtained in this research in ORTO-15 test at (35/40) point cut-off thresholds - following the scientific approach of other literatures [5, 10, 20, 23–25]. We recorded a 72.0% prevalence of ON at cut-off 40-point threshold, there was almost 3-fold decrease in the ON tendency at the 35-point threshold (31.8%). Similarly, many studies have not been satisfied with ORTO-15 questionnaire and its cut-off point as an instrument tool for measurement the ON [11, 26, 27]. Particularly, Dell'Osso, Abelli [27] have shown that a 35 cut-off, as compared to 40, can maximize specificity and sensitivity [27]. Furthermore, many studies recorded a decrease in the prevalence of ON to about two to three folds when they fix the cut-off at 35, as compared to the cut-off at 40 [11, 24, 25, 27].

Our results aligned to those studies indicating no Orthorexic features based on gender at 40-point threshold; but this was not the case at 35-point threshold. In males, ON tendency at 35-point threshold was 39.4%, compared to 28.6% in females 28.6% ( $p = 0.029$ ), and this was evident by MANOVA analysis,

which showed a clear significant effect of the gender as dependent variable on the ON tendency ( $p = 0.043$ ) (Tables 5 and 6). While we revealed a significant gender effect on the ON tendency; there is contradictory results between different studies in linking ON prevalence with gender; some authors have speculated a higher prevalence of ON among males [7, 28]; or females [27]. Whereas others revealed no significant gender differences [5, 10, 20, 23]. Due to Kamarlı Altun, Keser [29], the reason for these differences may be due to the socio-demographic and cultural differences between the sample groups in the studies.

Notwithstanding, Dell'Osso, Abelli [27] approved that females have more interest on healthy nutrition as they more careful about their body image and weight control. Also, this was indicated by Brytek-Matera, Donini [30], in a sample of university students, by which females have a strong preoccupation with healthy diet and it was positively correlated with physical appearance evaluation and body satisfaction.

As a confirm of our observations, the fact that ON was present among male university population, Ramacciotti, Perrone [11] hypothesized that ON in men could be related to health issues. Moreover, men take care of being healthfully by following accepted terms of beauty (culturally and socially). A different hypothesis explained that orthorexic behaviors in men is associated with characteristics of obsessive-compulsive personality and polarization to “masculine ideals” such as muscularity, strength, power and sportsmanship [28]

The current study revealed a significant difference recorded between the BMI categories and ON tendency at 35-point threshold ( $p = 0.007$ ). ON tendency increased gradually from 15.2%, 30.5%, 35.5–55.2% for underweight, normal weight, overweight to obese; respectively ( $p = 0.007$ ). Also, depending on the cut-off at 40-point threshold the ON tendency was higher on all BMI categories despite that there were no significant differences between different categories as shown in Table 4. Many previous studies did not reveal differences in the occurrence of ON tendency between BMI categories, for both cut-off point at 35 and 40 points [20, 25, 31]

Clearly, mixed findings can be shown in the previous studies; the current findings were in parallel with the results that showed a positive correlation between ON symptomatology and BMI [6, 7, 20, 28, 32]. On the contrary, many studies revealed no significant differences [5, 11, 24].

This study has several limitations including: the cross-sectional design, which could not assess causality of relationships, small sample size and choosing to participate, is a bias that might increase or decrease responses from students or nutritionists with ON. Despite these limitations, this study has several notable strengths, including it's the first study to investigate prevalence of ON in Jordan and particularly among nutrition field members.

## Conclusions

Despite the limitations on using ORTO-15 questionnaire and its cut-off point as an instrument tool for measurement the ON, we find that ON prevalence was 3-fold decrease in the ON tendency at the 35-point

threshold as compared to 40-point threshold in Jordan. Indeed, using cut-off at 35 is preferable than cut-off at 40 to identify external factors affecting ON. It has been observed that ON is affected by gender and BMI; ON increased in males and gradually positively increased as BMI increase. On the other hand, ON tendency was not affected by educational level. Finally, we need more studies to determine the prevalence of ON and variables describing ON tendency in Arab countries, especially among individuals working in the health sectors, moreover,

## Abbreviations

ON: orthorexia nervosa

MANAOVA: multiple analyses of variance.

BMI: body mass index

## Declarations

**Ethics approval and consent to participate:** Participants received an emailed research questionnaire, and they were given an informed consent form before assessment began.

**Consent for publication:** Not applicable.

**Availability of data and materials:** The authors confirm that the data supporting the findings of this study are available within the article.

**Competing interests:** The authors declare that they have no competing

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### Authors' contributions:

Mai Abdullah: Roles/Writing - original draft; Resources; Data curation; Investigation; Methodology.

Huda Al-Hourani: Conceptualization; Software; Supervision; Validation; writing-original draft; Project administration.

Buthaina Alkhatib: Data curation; Formal analysis; Roles/Writing - original draft; Visualization; Writing - review & editing.

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## Tables

Table 1  
Scoring Grid for ORTO-15 Responses

Items	Responses			
	Always	Often	Sometimes	Never
2, 5, 8, 9	4	3	2	1
3, 4, 6, 7, 10, 11, 12 14, 15	1	2	3	4
1, 13	2	4	3	1
Donnini <i>et al.</i> , (2005)				

Table 2  
Socio-demographic characteristics of the sample.

Variables	Males (n = 127)		Females (n = 294)		Total (n = 421)		P-value
	n	%	n	%	n	%	
	<b>Age group (yrs.)</b>	50	39.4	198	67.3	248	
18–22	59	46.5	60	20.4	119	28.3	
23–30	9	7.1	24	8.2	33	7.8	
31–40	9	7.1	12	4.1	21	5.0	
> 40							
<b>Marital Status</b>	103	82.4	247	84.0	350	83.5	0.761
Single	21	16.8	43	14.6	64	15.3	
Married	3	0.8	2	0.7	5	0.7	
Divorced	0	0.0	2	0.7	2	0.5	
Widowed							
<b>Educational level</b>	93	74.8	213	72.4	306	73.1	0.846
Students	24	18.7	58	19.8	82	19.5	
BSc. Holder	10	6.5	23	7.8	33	7.5	
Postgraduate							
<b>Experience Period (yrs.)</b>	86	67.7	242	82.3	328	78.0	0.002
No Experience	41	32.3	52	17.7	93	22.0	
One year or more							
<b>Smoking</b>	60	47.2	30	10.2	90	21.2	0.000
Smoker	36	28.0	205	69.7	241	57.3	
Non-Smoker	11	8.8	25	8.5	36	8.6	
X- smoker	20	16.0	34	11.6	54	12.9	
Hubble Bubbly							

Variables	Males		Females		Total		P-value
	(n = 127)		(n = 294)		(n = 421)		
	n	%	n	%	n	%	
Body Mass Index (kg/m <sup>2</sup> )	10	7.8	25	8.5	35	8.3	0.024
Underweight	73	57.5	197	67.1	270	64.3	
Normal	37	29.1	48	16.3	85	20.1	
Overweight	7	5.6	24	8.1	31	7.3	
Obese							

n: number of participants; yrs.: years, where  $p < 0.05$  is considered significant.

Table 3  
Orthorexia nervosa tendency in the total sample and gender groups.

Variables	Males	Females	Total sample	Chi-Squared	p-Value
	N = 127	N = 294	N = 421	Test	
Orthorexia nervosa n (%)	89 (70.1)	214(72.8)	303 (72.0)	0.32	0.570
ON tendency (< 40)	38 (29.9)	80 (27.2)	118 (28.0)		
Without ON tendency (< 40)					
Orthorexia nervosa n (%)	50(39.4)	84 (28.6)	134 (31.8)	4.77	0.029
ON tendency (< 35)	77(60.6)	210 (71.4)	287 (68.2)		
Without ON tendency (< 35)					

N: number; ON: orthorexia nervosa, where  $p < 0.05$  is considered significant.

Table 4  
Orthorexia nervosa tendency according to BMI categories.

Variables	Underweight N = 33	Normal N = 256	Overweight N = 80	Obese N = 29	Chi-Squared Test	<i>p</i> - Value
Orthorexia nervosa n (%)	27 (81.8)	180(70.3)	57(71.3)	24 (82.8)	3.63	0.304
ON tendency (< 40)	6 (18.2)	76 (29.7)	23 (28.7)	5 (17.2)		
Without ON tendency (< 40)						
Orthorexia nervosa n (%)	5 (15.2)	78 (30.5)	28(35.5)	16 (55.2)	12.08	0.007
ON tendency (< 35)	28 (84.8)	178(69.5)	52 (65.0)	13(44.8)		
Without ON tendency (< 35)						

N: number; ON: orthorexia nervosa; BMI: body mass index, where  $p < 0.05$  is considered significant.

Table 5  
MANOVA for the effect of BMI and Gender on ON tendency

	Wilks' Lambda	F	Hypothesis df	Error df	Sig
Gender	0.984	3.172	2	389.0	0.043
BMI	0.978	1.480	6	778.0	0.182
Gender * BMI	0.974	1.737	6	778.0	0.109

MANAOVA: multiple analyses of variance; ON: orthorexia nervosa, resulted from MANOVA test, where  $p < 0.05$  is considered significant.

Table 6

Results of MANOVA of ON tendency (&lt; 35) and ON tendency (&lt; 40) according to gender and BMI

Source of the variance	Dependent variables	F	P	Wilks' Lambda	P
Gender	ON tendency (< 40)	5.412	0.021	0.984	0.043
	ON tendency (< 35)	0.011	0.917		
BMI	ON tendency (< 40)	0.02	0.996	0.978	0.182
	ON tendency (< 35)	2.248	0.082		
Gender * BMI	ON tendency (< 40)	3.074	0.028	0.974	0.109
	ON tendency (< 35)	1.546	0.202		

MANOVA: multiple analyses of variance; BMI: body mass index; ON: orthorexia nervosa.  $p < 0.05$  is considered significant.

Table 7

Orthorexia nervosa tendency according to educational level

Variables	Students N = 304	BSc. Holder N = 81	Postgraduate N = 31	Chi-Squared Test	p-Value
Orthorexia nervosa n (%)	222 (73.0)	58 (71.6)	19 (61.3)	1.92	0.383
ON tendency (< 40)	82 (27.0)	23 (28.4)	12 (38.7)		
Without ON tendency (< 40)					
Orthorexia nervosa n (%)	96(31.6)	27(33.3)	7(22.6)	1.26	0.532
ON tendency (< 35)	208 (68.4)	54 (66.7)	24 (77.4)		
Without ON tendency (< 35)					

N: number; ON: orthorexia nervosa, where  $p < 0.05$  is considered significant.