

# **Prevalence of Orthorexia Nervosa and Associated Risk Factors: A Cross Sectional Study among University Students in Lebanon**

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A Thesis

presented to

the Faculty of Nursing and Health Sciences

at Notre Dame University-Louaize

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In Partial Fulfillment

of the Requirements for the Degree

Master of Science

In Human Nutrition

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by

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MAY 2020

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## Abstract

**Introduction** Orthorexia Nervosa (ON), or the obsession with healthy eating is a new eating disorder that has gained popularity in the recent years. A very limited amount of literature exists regarding ON in Arab countries including Lebanon. The objective of the current study was to assess the prevalence of ON in a representative sample of Lebanese university students, and different factors that might affect ON development.

**Methods** This was a cross-sectional study on 349 university students from three Lebanese regions: Mount Lebanon, North, and Shouf. The ORTO-15 scale was used to assess ON prevalence among the participants and associated factors.

**Results** The results showed that 84.8% of our sample has ON tendencies. The results of the multivariate analysis while taking ON as the dependent variable showed that; female gender (Beta= 1.33, p=0.016), studying a non-scientific major (Beta= 2.13, p=0.002), drinking 1-2 glasses of alcohol per week (Beta= 0.45, p=0.025), following a diet targeted at increasing muscle mass (Beta= 3.52, p=0.011), and having a similar financial situation than other people of the same age (Beta= 1.05, p=0.032) to be significantly associated with a higher risk of ON behaviors.

**Conclusion** A high prevalence of ON was observed in our sample. Lebanese university students might be fixated on a healthy and proper nutrition especially due to the influence of social media. Awareness needs to be raised regarding ON and its consequences.

**Level of evidence** Level 5, Cross-sectional descriptive study

**Keywords** Orthorexia Nervosa – University students – Nutrition – Health - Prevalence



## **Introduction:**

Obesity is well known to be increasing worldwide, and studies have shown an increasing prevalence in Middle Eastern countries (66%-75%) and Lebanon (37%) as well (Nasreddine et al., 2017). Therefore, the trend towards healthy eating and awareness about the food consumed is gaining popularity. The benefits of having a healthy lifestyle including healthy eating habits are indeed very well documented such as decrease in all-cause mortality (RR=0.77, 95% CI: 0.76-0.78), cardiovascular mortality (RR=0.77, 95% CI: 0.74-0.80), and cancer risk (RR=0.83, 95% CI: 0.81-0.86) (Onvani et al., 2016). Taking these behaviors to the extreme are shown to be problematic, even dangerous, like in the case of Orthorexia Nervosa (ON) characterized by long term extreme healthy eating behavior and affection of quality of life (Donini et al., 2004). The prevalence of ON worldwide varies significantly from 6% in a study done on an Italian population (Donini et al., 2004) to 88.7% in a study performed on Brazilian females (Souza & Rodriguez, 2014). ON tendencies have been suggested to be increasing over the years (Matera, 2012), from 6.9% (Donini et al., 2004) to 57.6% (Bo et al., 2014) in the Italian population.

ON, derived from the Greek words “orthos” meaning true and “orexia” meaning appetite, (Karakus, et al., 2017) was first defined by Bratman (Bratman & Knight, 2000) as a “fixation on eating healthy food” that eventually becomes an unhealthy obsession with consuming healthy food. Until this day, ON is not yet an acknowledged disorder by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). This disorder mainly starts by causing psychological distress (Ramacciotti et al., 2010), but can continue into a very restrictive food intake leading to unbalanced diets (Bagci-Bosi et al., 2007). It may have many consequences including unintended weight loss (Dunn & Bratman, 2016) and malnutrition (Morozze et al., 2015), and in these extreme cases, it can lead to complications similar to those of

anorexia, such as anemia, osteopenia, metabolic acidosis, and bradycardia (Koven & Abry, 2015). In a study performed on 404 Italian participants in La Rome University, it has been reported that in some extreme cases, patients with ON would rather starve than eat anything considered to be “impure or unnatural” (Donini et al., 2004).

People with ON have been shown to have similar traits to both eating disorders and obsessive-compulsive disorder (Tremelling et al., 2017; Koven & Abry, 2015) (Figure 1).

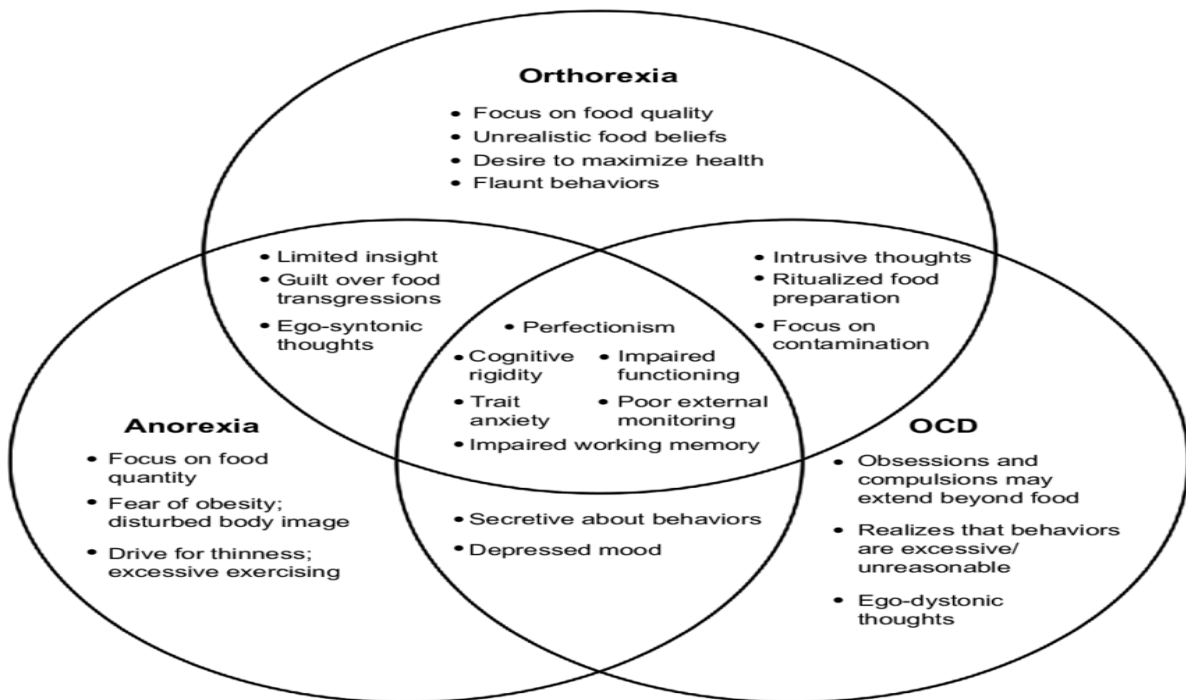


Figure 1. Overlapping Characteristics of ON, AN, and OCD. (Adapted from Koven & Abry, 2015)

In addition, ON has been characterized by obsessive thinking about food, restrictive eating patterns, specific food preparation methods, initiating self-punishment by fasting or over-

exercising, and the conviction that dietary choices affect one's self-esteem (Tremelling, et al., 2017).

Contrary to eating disorders, such as anorexia and bulimia, that focus on weight status and body image; ON is driven by the adoption of healthy eating habits for disease prevention mainly chronic non-communicable diseases such as diabetes, cardiovascular problems, and cancer among others (Dunn & Bratman, 2016; Ramacciotti et al., 2010). In other words, the disorder does not focus on the quantity of food consumed but rather on the quality of food in terms of source, processing or packaging, etc. (Koven & Abry, 2015). Nevertheless, similar to restrictive anorexia, patients with ON may exhibit distinctive personality traits such as obsessive-compulsive mechanisms (Zamora et al., 2005). It has also been shown that ON has a negative impact on the quality of life, leading to social withdrawal portrayed as loneliness exhibited by 40.7% of orthorexic participants (n=404, 58.7% females) (Donini et al., 2004). Similarly, ON can cause a financial burden as a result of only purchasing foods deemed to be "acceptable" (Borgida et al., 2011). The day-to-day diet of ON patients is divided into four stages as proposed by Zamora et al., in 2015 and it is repeated as a vicious cycle (Table 1).

**Table 1. Day-to-day diet configuration as proposed by Zamora et al., (2015)**

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**Phase 1:** Meal planning for the same or following day

**Phase 2:** Careful procurement of the ingredients

**Phase 3:** Preparation method of each meal or ingredient

**Phase 4:** Feelings based on the preceding three phases: satisfaction, comfort, or guilt

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There have been several assessment tools used in the literature for assessment of ON which makes it difficult to compare the different studies' results leading to misleading comparisons of prevalence rates (Koven & Abry, 2015). The first tool used was Bratman's Orthorexia Test (BOT) consists of 10 yes/no type questions (Bratman Test, n.d.). However, this test was not assessed for reliability or validity. It was later used as a foundation for the development of other questionnaires, such as the most utilized nowadays, Orthorexia Nervosa Questionnaire (ORTO-15). It was translated to numerous languages including Spanish, German, Turkish, Polish, and Portuguese (Missbach et al., 2017), and adjusted for several populations. Turkish researchers created the ORTO-11 by eliminating four questions and adapting it more to the Turkish population. Similarly, Hungarian researchers created the ORTO-11hu but eliminated four different questions than the Turkish in order to adjust it to the Hungarian population. Inspired by the ORTO-15, another test was created termed the Eating Habits Questionnaire (EHQ). EHQ is a 21-item questionnaire that determines the presence of ON related symptoms in individuals by examining knowledge and feelings associated with healthy eating habits (Gleaves et al., 2013). In a study performed in the US, EHQ was found to have good validity, reliability, and internal consistency (Gleaves et al., 2013).

Using the ORTO-15 as an assessment tool, Ramacciotti et al. studied ON prevalence in 177 random Italian participants and found that 57.6% were at high risk (Ramacciotti et al., 2011). Similarly, Malmberg et al., in 2017, studied ON prevalence among 207 Swedish undergraduate students of science and business majors using the ORTO-15. Two cut-off values for ON scoring were used, when 40 was used, 76.6% were shown to have ON tendencies, and when 35 was used the prevalence decreased to 26.6% students showing ON tendencies. Furthermore, Varga et al., created the Hungarian modification termed ORTO-11-hu adapted from ORTO-15 to assess the

prevalence of ON in Hungary. Results showed that 74.2% out of 810 students from different majors had a tendency for ON considering 40 points as the cut-off value for the test. Many researchers discussed ON prevalence in various regions of Turkey. The prevalence ranged from 41.9% in 177 Turkish dietitians (Asil & Sürücüoğlu, 2015), 45.5% in resident medical doctors (Bagci Bosi et al., 2007) to 81.8 % in Turkish Opera singers (Aksoydan & Camci, 2009). On the other hand, a study done by Dunn et al., in 2017 found that the prevalence of ON in 275 US college students was 71% (using 40 as a cut-off value); but less than 1% suffered a detrimental effect on their daily activities or medical status due to ON (Dunn et al., 2016). All of this stresses the need of a clear diagnostic criteria of ON and a universal validated tool to assess its true prevalence.

Due to the extensively differing estimates of ON prevalence based on multiple diagnostic tools used, limited studies investigating ON in college students and the scarce presence of data in Lebanon, more research is needed to better comprehend this disorder. In addition, the factors that might contribute to the presence or absence of ON in an individual are still unclear due to the limited number of studies covering the topic. The primary objective of this study was to assess the prevalence of ON among college students in different regions of Lebanon. The secondary objective was to evaluate the different factors that might have an impact on ON development.

## **Methods:**

### **Study design and recruitment methods**

This is a cross-sectional study assessing the risk of ON in nutrition students via a written questionnaire. The approval of the Institutional Review Board (IRB) at Notre Dame University-Louaize was granted prior to data collection.

A sample of 349 students registered in Liberal Arts Curriculum courses from Notre Dame University-Louaize (NDU) located in 3 main regions of Lebanon (Mount Lebanon, North, Shouf) was chosen. The Deans of the different faculties in these universities were contacted via e-mail to get approval for participation in the study. Researchers visited the classes that were in session during the time of visit students during summer semester 2019 and distributed the questionnaire to the students to be filled along with a consent form. Participation was voluntary and students were not offered any compensation for their participation. To be included in the study, the participants had to fill both the questionnaire and the ORTO-15 test.

### **Data collection procedure**

Data were collected anonymously (i.e. no names, IDs, or any other personal identifiers were requested) to avoid participants' attempt to hide sensitive information from researchers (such as weight, financial status, etc.). All data forms were maintained in a locked cabinet in the principal investigator's office, and access was strictly limited to study investigators. Likewise, computerized data were stored on a password protected computer.

### **Pilot Testing**

The questionnaire was pre-tested during the fall semester of 2019. The draft questionnaires were tried out on a random sample of 50 students (~ 15% of the sample size). Pilot testing was performed to measure how much time it takes to complete the questionnaire and identify problems with content of the questionnaire. Corrections to clarify directions, question wording, or response categories where necessary were implemented before launching of the actual data collection. This sample used for pilot testing was not included in data analyses.

## **Instruments and Calculations**

### *Instrument*

The questionnaire was divided in two sections. The first section pertaining to background information, including age, sex, college region, smoking and exercise habits, and self-reported weights and heights among others. The second section was the ORTO-15 used to assess the prevalence of ON in this study.

Most of the researchers have used the ORTO-15 questionnaire, and as mentioned, it has been the basis to the adjustment of other questionnaires used. To be able to compare our results with the majority of the published literature, we decided to use the ORTO-15 questionnaire to assess the prevalence of ON in our population. The ORTO-15 is a 15-item Likert-scale type partially validated questionnaire used to assess the risk of ON with four possible answers: always, often, sometimes, or never. Questions included focused mainly on the quality of food consumed, feelings and perceptions toward food, as well as time spent thinking about food. The score was calculated following a scoring system provided for each question. After addition of the specific values for each answer-question, an overall score was calculated. A score below 40 was used as an indication for high ON risk, as seen in a validation study by Donini et al., in 2005, where the cut-off value of 40-presented 100% sensitivity and 100% negative predictability.

BMI was calculated from the self-reported weights and heights. A BMI below 18.5 kg/m<sup>2</sup> was considered as underweight, a BMI between 18.5 and 24.9 kg/m<sup>2</sup> as normal, a BMI between 25.0 and 29.9 kg/m<sup>2</sup> as overweight, and a BMI above 30.0 kg/m<sup>2</sup> as obese (Centers for Disease Control and Prevention, 2017).

### *Statistical Analysis*

Data were entered, cleaned and analyzed using SPSS 23.0. The significance level was set at  $p < 0.05$ . The dependent variable was the ON score, and the independent variables included were age, gender, economic status, Grade Point Average (GPA), major of studies, classification in university, physical activity, smoking habits, and BMI among others. Majors were grouped into two categories, “Health related majors” and “others” as several studies suggested a higher prevalence of ON risk in students with health-related majors (Bo et al., 2014). In this study, health related majors included nutrition, nursing, biology, physical education, and psychology. Descriptive statistics were presented as percentage (%) and frequency (n) for categorical variables and mean and standard deviation (SD) for continuous variables. ON was used as a continuous variable. Independent sample T-test and ANOVA/Kruskall-Wallis tests were used to assess the relationship between ON and categorical variables. Pearson correlation was used to assess the association between ON and continuous variables.

## **Results:**

### *Sample Characteristics*

The sample was composed of 349 university students.

Among 349 participants, the majority were senior students (43.6%) with a mean age of  $20.93 \pm 1.89$ , gender distribution was almost similar (male: 49.6%, female: 50.4%), and the majority of the participants had a healthy body weight (57.3%). 84.1% of the respondents were in non-health related majors and most of them had no medical problems (87.1%). Furthermore, the majority were not following any dietary plan (82.7%), or using any medication or supplementation (77.5%). Almost 65% of the participants did not smoke, 69.5% consumed alcohol, and more than half (58.1%) performed physical activity. The mean ON score was found to be  $36.11 \pm 4.54$ . The detailed characteristics of the sample population are shown in table 2.



Table 2. Socio-demographic & anthropometric characteristics (N=387)

Characteristics	mean $\pm$ SD,	
	N	%
<b>Age</b>	387	20.93 $\pm$ 1.89
<b>GPA</b>	353	2.94 $\pm$ 0.49
<b>Gender</b>	Male	192 49.6
	Female	195 50.4
<b>Classification</b>	Sophomore	86 22.2
	Junior	140 36.2
	Senior	161 41.6
<b>University Location</b>	Mount Lebanon	331 85.5
	North	27 7.0
	Shouf	29 7.5
<b>Financial Status</b>	Less than most people my age	21 5.5
	Similar to most people my age	288 75.2
	Better than most people my age	74 19.3
<b>BMI</b>	Underweight	23 6.0
	Healthy Weight	239 62.6
	Overweight	94 24.6
	Obese	26 6.8
<b>Medical Condition</b>	Yes	50 12.9
	No	337 87.1
<b>Specific Diet Plan</b>	Yes	67 17.3
	No	320 82.7
<b>Use of Medication/supplements</b>	Yes	87 22.5
	No	300 77.5
<b>Smoking Status</b>	Smokers	138 35.7
	Non Smokers	249 64.3
<b>Alcohol Consumption</b>	Yes	269 69.5
	No	118 30.5
<b>Exercise Status</b>	Exercisers	225 58.1
	Non Exercisers	162 41.9
<b>Courses taken</b>	NTR 201/HEA 201	236 61.0
	None	151 39.0
<b>Major</b>	Health Major	61 15.9
	Other	323 84.1
<b>ON Score</b>	387	36.11 $\pm$ 4.54

\*Health Major (nutrition-nursing-biology-psychology-physical education).

\*\*NTR: Nutrition – HEA: Health

\*\*\*GPA: Grade Point Average – BMI: Body Mass Index

\*\*\*\*N: Number of students – SD: Standard Deviation – ON: Orthorexia Nervosa

### *Bivariate Analysis*

A significantly higher mean of ON was found in students who were not following a diet plan compared to those who were (36.49 vs. 34.28, p-value: <0.01). Similarly, students who were not using any type of medication or supplementation as opposed to those who were (36.41 vs. 35.08, p-value: 0.016) showed higher mean ON score. Students who did not perform any physical activity were found to have a higher mean of ON than those who performed physical activity (35.53 vs 36.91, p-value: 0.003). In addition, mean ON score was significantly higher in consumers as compared to non-consumers of alcohol (36.6 vs. 34.98, p-value: 0.002). There was no significant difference in the mean of ON score among the categories of the remaining variables. Results are all portrayed in table 3.

### *Multivariate Analysis*

The multiple linear regression analysis was used to assess the relationship between ON and major of study adjusting for confounders (age, gender, BMI, university classification, exercise, financial situation, presence of a medical condition, use of medication or supplementation, smoking, alcohol intake, major of studies, previous enrollment in a nutrition or health course, following a specific diet). It was found that females have higher ON score by 1.33 (p=0.016). Moreover, students who considered themselves to have a similar financial situation to the rest of their peers showed an increase in ON score by 1.05 (p=0.032). Students pursuing a non-health related major (health related majors considered in this study: nutrition, nursing, psychology, biology, and physical education), had an ON score higher by 2.13 (p=0.02) than students enrolled in health related majors. Furthermore, students who consumed 1-2 glasses of alcohol per week and students who followed a diet targeted at increasing their muscle mass exhibited an

increase in ON score by 0.45 ( $p=0.025$ ) and 3.52 ( $p=0.011$ ), respectively. The results of the regression analysis are shown in table 4.

Table 3. Relationship of ON with different independent variables (N=387)

ON		Mean	±SD	P value
<b>BMI</b>	Less than 18.5	36.39	±3.65	0.193
	Between 18.5 and 24.9	36.2	±4.40	
	More than 25	36.03	±4.59	
<b>Classification</b>	Sophomore	35.67	±4.86	0.096
	Junior	36.64	±3.96	
	Senior	35.88	±4.82	
<b>University Location</b>	North	35.37	±4.91	0.663
	Shouf	35.97	±4.58	
	Mount Lebanon	36.18	±4.52	
<b>Financial Status</b>	Less	35.76	±4.71	0.066
	Similar	36.43	±4.39	
	Better	35.07	±4.94	
<b>Faculty</b>	FE	36.8	±4.43	0.36
	FBAE	36.15	±4.36	
	FNHS	35.19	±4.77	
	FNAS	35.48	±5.51	
	FH	35.76	±4.48	
	FAAD	36.77	±4.54	
	FLPS	35	±3.87	
<b>Gender</b>	Male	35.75	±4.52	0.124
	Female	36.46	±4.55	
<b>Medical Condition</b>	Yes	35.1	±4.11	0.093
	No	36.26	±4.59	
<b>Diet Plan</b>	Yes	34.28	±4.712	< <b>0.01</b>
	No	36.4	±4.42	
<b>Medication Use</b>	Yes	35.08	±3.61	<b>0.016</b>
	No	36.41	±4.74	
<b>Smoking Status</b>	Smoker	36.32	±4.51	0.498
	Non Smoker	35.998	±4.56	
<b>Alcohol Consumption</b>	Consumer	36.6	±4.35	<b>0.002</b>
	Non Consumer	34.98	±4.78	
<b>Exercise Status</b>	Exerciser	35.53	±4.52	<b>0.003</b>
	Non Exerciser	36.91	±4.46	

<b>NTR/HEA Course</b>	NTR or Hea	36.21	±4.50	0.577
	None	35.95	±4.62	
<b>NTR Major Vs Others</b>	NTR Major	34.98	±4.33	0.072
	Others	36.27	±4.57	
<b>Health Majors Vs Others</b>	Health Majors	35.18	±4.70	0.06
	Others	36.33	±4.50	
<b>Age</b>		36.11	±4.54	0.238
<b>GPA</b>		36.11	±4.54	0.121

\*SD: Standard Deviation

\*\*GPA: Grade Point Average – BMI: Body Mass Index

\*\*\*NTR: Nutrition – HEA: Health

Table 4. Regression Analysis

<b>Regression</b>				
<b>Independent variables</b>	<b>Unstandardized <math>\beta</math></b>	<b>95.0% CI</b>		<b>p-value</b>
Age	-.21	-.520	.104	.191
BMI categories	.50	-.402	1.399	.277
University Classification	.25	-.470	.964	.498
Exercise	-.62	-1.574	.331	.200
Financial situation	1.05	.090	2.002	<b>.032</b>
Medical conditions	-.82	-2.257	.609	.259
Use of medication or supplement	-1.07	-2.214	.081	.068
Smoking	-.24	-1.273	.789	.645
Gender	1.33	.250	2.413	<b>.016</b>
Number of alcohol drinks per week	.45	.058	.839	<b>.025</b>
Major Categories	2.13	.813	3.446	<b>.002</b>
Courses combination	.13	-.838	1.092	.796
NLC	1.48	-.443	3.408	.131
Shouf	.40	-1.304	2.099	.646
Diet				
Increase muscle	3.52	.796	6.252	<b>.011</b>

Weight loss	.42	-1.696	2.529	.698
Other diet	1.60	-.028	3.232	.054
Model statistics: R <sup>2</sup> = 0.132, p-value of the model ANOVA <0.001				

\*CI: Confidence Interval

\*\* BMI: Body Mass Index

\*\*\*NLC: North Lebanon Campus

## Discussion:

This study entails the assessment of the prevalence of ON and its associated factors in a representative sample of university students from all majors in three different regions of Lebanon. The cut-off value used to determine the prevalence of ON was ON score <40. The lower the value the higher the risk.

A high prevalence of ON risk was found among our studied population (84.8%), comparable to the prevalence rates found in a representative sample of the Lebanese population (75.2%) (n=806, 66.5% females, age 27.59±1.76) and a sample of Lebanese medical students (74.5%) (n=627, 50.4% female, age 21.8±2.0) as reported by Haddad et al., 2019 and Farchakh, Hallit & Soufia, 2019. Furthermore, Malmberg et al., in 2017, studied ON prevalence among 207 Swedish undergraduate students of science and business majors using the ORTO-15, and 76.6% were shown to have ON tendencies. The same high prevalence was observed in Hungary where 74.2% of undergraduate students (n=810, 89.4% females, age 32.39±10.37) were found to have orthorexic tendencies (Varga et al., 2014). This high prevalence of ON in our sample population could be attributed to the fact that university students are influenced by many sociocultural factors as well as social media which has been focusing in the recent years on the importance of healthy eating habits (Turner & Lefevre, 2017).

In our study, men showed higher risk of ON than women which is consistent with the results of Malmborg et al., in a sample of 207 undergraduate students (34.6% vs. 20.6%;  $\text{Chi}^2 = 4.63$ ;  $p=0.031$ ) (Malmborg, et al., 2017). Different other studies also showed a higher prevalence of ON in males than females (Oberle et al., 2017; Fidan et al., 2010). However, our results are in conflict with the results of Haddad et al., in a sample of 811 Lebanese participants from all Lebanese Governorates which found a higher prevalence in females (Beta = -0.739,  $p=0.020$ ). Eating disorders are generally more common in females than males as in Anorexia and Bulimia Nervosa; however, a proposed explanation was that females are more interested in body image and weight loss, rather than adoption of a healthy lifestyle only (Bratman & Dunn, 2016). Whereas males are more interested in sports, and performance which requires following a healthy lifestyle (Segura-Garcia, et al., 2013). Nevertheless, the data on gender's association with ON is still very controversial in the literature.

In accordance to our results, Hyrnik et al., found an association between ON and a higher socio-economic class (OR= 2.40,  $p<0.05$ ) in a sample of 992 adolescent Polish girls and 907 adolescent Polish boys (Hyrnik et al., 2016). This would be attributed to the fact that products labeled as “organic” or “healthy” are usually more expensive in the market (Mie et al. 2017), and so following a healthy lifestyle to the extreme would require a big budget to be able to acquire all the products deemed acceptable.

The findings concerning the association between alcohol and ON are very scarce. Our results showed that consuming 1-2 drinks of alcohol per week was associated with a decreased ON risk. In contradiction to our results, some researchers suggest that non-users would be at a greater risk of developing ON (28.10 vs. 29.47,  $p<0.05$ ) in a sample of 810 Hungarian participant (89.4% female, age:  $32.39\pm 10.37$ ) (Varga et al., 2014) due to their inclination towards leading a healthy

lifestyle. On the contrary, others found the association to be non-significant in a sample of 44 Turkish performance artists including 54.5% females and a mean age of  $38.8 \pm 10.74$  (37.8 vs. 38.0,  $p=0.084$ ) (Aksoydan & Camci, 2009). General health recommendations consider having 1 drink for females and 2 drinks for males per day to be within a healthy lifestyle (CDC, 2020). Therefore, opposite to an individual obsessed with calories or dieting, an individual obsessed with eating healthy as is the case for ON considers having alcohol in the recommended amount as part of a healthy lifestyle.

When comparing the difference in ON tendencies between health-related majors (nutrition, nursing, biology, psychology, and physical education) and other majors, we found a higher frequency of ON in health majors. Similarly, Malmberg et al., found a higher frequency of ON in exercise science students (84.5% vs. 65.4%,  $p= 0.002$ ) in a sample of 207 total students (Malmberg et al., 2017). On a similar note, it is postulated that students in health-related majors, mainly nutrition are more prone to show ON behaviors 35%-57.8% compared to 6.9% only in the general population (Varga et al., 2013). Researchers have suggested that this disordered eating pattern could be the motive to get enrolled in a health-oriented program such as nutrition or that during the course of such studies, the individual might develop impaired behaviors towards healthy eating (Korinth et al., 2008). Noting that these individuals are sensitive to problems surrounding health, and may feel pressure to be role models in the society, it is empirical to continue studying the prevalence of orthorexia in this population (Koven & Abry, 2015).

Our results showed that students who followed a diet specifically tailored to increase their muscle mass are at a lower risk of ON than others. Numerous studies have shown that eating

healthy food and targeting good food quality to be associated with an increased risk of ON. A study, by Varga et al., done in Hungary indicated that eating only healthy food was found to be associated with higher ON risk (27.20 vs. 28.97,  $p < 0.001$ ) (Varga et al., 2014). In another study in Turkey, 257 out of 318 resident doctors considered the quality of the food consumed to be important. These participants had a lower mean ON score (indicating a higher risk) than participants who don't consider the quality of food consumed to be important (ON: 39.5 vs. 41.0,  $p < 0.001$ ) (Bagci Bosi et al., 2007). Moreover, Varga et al., found a lower ON score (indicating higher ON tendencies) in participants following a special diet (27.86 vs. 29.07,  $p < 0.001$ ). All the students following a diet targeting an increase in muscle mass in our study are from non-health related majors, which as discussed above have a lower ON risk than students in health related majors. On a similar note, students from non-health majors might not have a proper understanding as to what a diet targeted at increasing muscle mass actually entails. Moreover, 64% of students following this diet exercise for five or more hours per week, so they might be more pre-occupied with exercise than obsessing about healthy food.

The limitations of our study include its cross-sectional design which cannot assess causes of ON, lack of psychological evaluation of the participants, and use of a scoring tool to assess for ON which has been criticized in previous literature. On the other hand, the strengths of the study include the addition of value to the literature concerning ON in the Arab world, as the studies are very scarce (only two studies found). In addition, to our knowledge, this is the only study to have analyzed ON with different types of diets instead of assessing if the individual is following a diet in general.

## **Conclusion:**



Following a healthy diet should have positive physiological and psychological effects on the body. In the recent years, awareness of the importance of following a healthy lifestyle including a healthy diet has increased, and some people are taking these recommendations to the extreme.

A high percentage of ON behaviors was observed in our study, but the finding can be considered as preliminary due to the limitations of the study mentioned above. We need a universal validated screening tool to better assess and compare its actual prevalence in different regions of the world. In addition, we need more longitudinal prospective studies to be able to determine causality and correlates of ON while taking into account the psychological aspects of the participants preferably through clinical interviews rather than questionnaires to ensure accuracy of results. Schools, universities and the media should make efforts towards raising awareness of ON, and emphasize the importance of a healthy flexible lifestyle rather than a healthy, rigid, socially and mentally impaired one.

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# Appendix A: Questionnaire Form

## Faculty of Nursing & Health Sciences- Notre Dame University-Louaize (NDU) Consent Form to Participate in a Research Study

**This is a consent form to participate in a research study.** If you decide to participate, you will have to mark your consent below and return this form to the study investigators.

### **Who are we?**

We are a group of researchers from the Faculty of Nursing & Health Sciences, NDU.

### **What is the purpose of the study?**

We are interested in assessing the prevalence of Orthorexia Nervosa among Lebanese nutrition university students, and its association with several factors.

### **What does the study entail?**

Participants will be asked to complete one questionnaire. Trained dietitians will visit classrooms and handout the questionnaire to be filled. The questionnaire requires approximately 15 minutes of your time. No compensation will be attributed for participation. By taking part in this survey, you will be contributing to scientific knowledge in this field, particularly in Lebanon.

### **What about anonymity, and/ or confidentiality?**

You will not be asked to provide your name, ID number, or any other personal identifier, all data from this study will be maintained in a secure location, and access will be strictly limited to study investigators. Any report of this research that is made available to the public will not include your name or any other individual information by which you could be identified.

### **What are my rights as a study participant?**

Taking part in this research is voluntary and declining to participate will not bear any academic/ nonacademic consequences.

### **Whom do I call if I have questions?**

For questions about the study, contact the researchers at the email address: [afarhat@ndu.edu.lb](mailto:afarhat@ndu.edu.lb)

### **STATEMENT OF CONSENT:**

I have read this form. I have had the opportunity to ask questions and have had them answered to my satisfaction. In addition, I have been assured that any future questions that I may have will also be answered by the research investigators.

- By checking this box, I indicate that I voluntarily agree to participate in this study.
- By checking this box, I indicate that I am not interested in participating in this study.

**Date:**

**Section A: Background Information:**

- a. What is your age?
- b. What is your sex?
  1. Male
  2. Female
- c. What is your classification in university?
  1. Sophomore
  2. Junior
  3. Senior
  4. Graduate student
- d. What is your current major of studies?
- e. Have you taken any of the following courses?
  1. NTR 201
  2. HEA 201
  3. None of the above
- f. Where is your university located?
  1. Mount Lebanon
  2. North
  3. Chouf
- g. What is your current GPA?
- h. I consider my financial situation to be:
  1. Better than most people my age
  2. Similar to most people my age
  3. Less than most people my age
- i. What is your weight (kg)?
- j. What is your height (cm)?

k. Have you been diagnosed by a doctor with any of the following chronic medical conditions?

- 0. No
- 1. Yes

l. If yes, please specify:

- 1. Cardiovascular disease
- 2. Cancer
- 3. Obesity
- 4. Hypertension
- 5. Diabetes
- 6. Others. Please specify:

m. Are you currently following any specific dietary plan?

- 0. No
- 1. Yes. Please specify:

n. Are you taking any type of medication or supplement?

- 0. No
- 1. Yes. Please specify:

o. Do you smoke?

- 0. No
- 1. Yes

If you answered no, please proceed to question “q”.

p. How many cigarettes do you smoke per day?

- 1. Less than 5
- 2. 5-10
- 3. 11-19
- 4. 20 or more

q. Do you consume alcohol?

- 0. No
- 1. Yes

If you answered no, please proceed to question “s”.

r. How many times do you drink alcohol per week?

- 1. Less than one glass
- 2. 1-2 glasses
- 3. 3-4 glasses
- 4. 5 or more glasses

- s. Do you exercise?
  - 0. No.
  - 1. Yes. If yes please specify the type:

If you answered no, please proceed to the next section.

- t. How many hours do you exercise per week?
  - 1. 1-2 hours
  - 2. 3-4 hours
  - 3. 5 hours or more

**Section B: ORTO-15 Questionnaire:**

- 1. When eating, do you pay attention to the calories of the food?
  - a. Always
  - b. Often
  - c. Sometimes
  - d. Never
  
- 2. When you go in a food shop, do you feel confused?
  - a. Always
  - b. Often
  - c. Sometimes
  - d. Never
  
- 3. In the last 3 months, did the thought of food worry you?
  - a. Always
  - b. Often
  - c. Sometimes
  - d. Never
  
- 4. Are your eating choices conditioned by your worry about your health status?
  - a. Always
  - b. Often
  - c. Sometimes
  - d. Never
  
- 5. Is the taste of food more important than the quality when you evaluate food?
  - a. Always
  - b. Often
  - c. Sometimes



- d. Never
6. Are you willing to spend more money to have healthier food?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  7. Does the thought about food worry you for more than three hours a day?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  8. Do you allow yourself any eating transgression?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  9. Do you think your mood affects your eating behavior?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  10. Do you think that the conviction to eat only healthy food increases self-esteem?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  11. Do you think that eating healthy food changes your lifestyle (frequency of eating out, friends, etc.)?
    - a. Always
    - b. Often
    - c. Sometimes
    - d. Never
  12. Do you think that consuming healthy food may improve your appearance?
    - a. Always
    - b. Often

- c. Sometimes
- d. Never

13. Do you feel guilty when transgressing?

- a. Always
- b. Often
- c. Sometimes
- d. Never

14. Do you think that on the market there is also unhealthy food?

- a. Always
- b. Often
- c. Sometimes
- d. Never

15. At present, are you alone when having meals?

- a. Always
- b. Often
- c. Sometimes
- d. Never