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Original article

Does food disgust has a relationship with orthorexia nervosa? Correlation with gender and body mass index

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Abstract. *Objective:* This study was conducted to determine the association of the predisposition to food disgust and orthorexic tendencies to gender, BMI and some variables. It is the first study to assess food disgust, disgust propensity and sensitivity and its relationship to orthorectic tendencies in Turkish sample. *Method:* The study was conducted on a total of 300 young individuals, consisting of 199 males and 101 females. The Food Disgust Scale (FDS), Orthorexia Nervosa (ON) (ORTO-11) Scale, Disgust Propensity and Sensitivity Scale- Revised (DPSS-R) and a personal information form were administered. *Result:* The average age of the individuals was 24.28±6.60 year. The mean BMI of men (23.88 ± 3.31 kg/m^2) was significantly higher than women (21.64 ± 3.50 kg/m^2) (p <0.001). The mean DPSS-R of women (51.09 ± 12.49) was significantly higher than men (46.67 ± 12.21). The mean DPSS-R in the underweight category (59.92 ± 9.96) was significantly higher in both the normal category (48.10 ± 12.37) and the overweight category (46.33 ± 12.17) (p values 0.004 and 0.001, respectively). As a result of simple linear regression analysis performed for DPSS-R, female gender increased DPSS-R by 4.42 units according to male gender (p = 0.004). Correlation coefficients of the FDS and DPSS-R were found to be positive, moderate (r = 0.45, p <0.001). *Discussion:* It is suggested that the individuals, and may be the patient groups in the future, should be administered the FDS and DPSS-R scale to identify the prevalence in the public and to determine their food disgust sensitivities in further studies. In the future studies of this data specific to our country is intended to be used as a reference.

Keywords: Food disgust, disgust sensitivity and propensity, orthorexia nervosa.

1. Introduction

Cultures, habits, daily lifestyles, and relatedly nutrition habits change rapidly. This change paves the way for research and debate on whether some unnoticed or unattended behavioral patterns may be considered pathological or close to any existing pathologies (1). Although the studies on food disgust have increased considerably over the last decade, the number of studies published on the effects of food disgust on food-associated behaviors remains limited (2).

Those with a tendency to disgust may share similar individual characteristics not only culturally but also interculturally (3). The ethical concept of disgust may gain importance with recently introduced food technologies and the appropriately or inappropriately processed meat products are considered (4, 5). While most people in Western societies qualify eating cats or dogs disgusting (morally unacceptable and unquestionable), in some non-Western countries these animals comprise certain components of their cuisine (4). The studies in the literature have focused on two cues eliciting a reaction of disgust, which are named either unethical behaviors or hazardous substances associated with pathogens (6). Rotten and decaying food of animal or non-animal origins is usually associated

with changes in color, texture, smell, and taste, being recognized as disgusting even if they do not always represent a sign of pathogen availability (4).

The tendency to disgust has defined the likelihood of an individual hearing disgust, and the sensitivity of disgust has been defined as the degree of disgust. Although the current tools tend to evaluate only the tendency to disgust and/or only the sensitivity of disgust in the context of specific diagnoses, the Disgust Tendency and Sensitivity Scale-Revised (DPSS-R) measures both structures transdiagnostically (7). Overveld et al. (2006) designed DPSS-R. In psychopathology, there is increasing interest in the potential role of disgust (general tendency to react to disgust in any situation). DPSS makes a valuable contribution to the index resource currently available in disgust research (8).

Food disgust is assumed to share several common variations with both food neophobia and selective eating disorder based on the empirical evidence indicating that it contains aspects from either of these two contrasting entities (9). Disgust may reduce the likelihood of food poisoning, a direct consequence of eating rotten or contaminated food. It is, therefore, reasonable to assume that people showing less food disgust sensitivity are more likely to expose themselves to risks associated with food, or those having suffered from a variety of foodborne illnesses are more likely to develop disgust (4). It can be assumed that these factors may also contribute to other non-clinical types of disorders including Orthorexia Nervosa (ON).

In this study, the last version of the Food Disgust Scale (FDS) consisting of 32 items has been used (4). In this new scale, "disgust sensitivity" has been conceptualized by Haidt et al. (1994) and Olatunji et al. (2007) (6, 10). Therefore, the new scale measures the cause of "food" disgust as a trait gauge of disgust (that is, it measures the emotional predisposition that causes someone to disgust either more or less easily when triggered by food-associated cues). The scale items do not focus on aversion from food due to a specific medically associated condition such as lactose intolerance or food allergies leading to disgust potentially. The investigators question whether the participants perceive eating as disgusting rather than asking the participants if they are willing to eat certain items. The desire to eat or not to eat may not be a determinant of food disgust sensitivity as people may be obliged to eat for a variety of reasons (for example, due to social pressure and/or prevention of food waste) even though they have a feeling of disgust.

Previous studies have shown that women show more disgust sensitivity than men. Women scored significantly higher on almost subscales in the domain of food and short FDS. In line with previous results by Petrowski et al. (2010), the association with age was weak in Hartmann et al. (2018)'s food disgust study (11).

Disgust plays an important role in our everyday lives. For instance, disgust can influence handwashing and eating behavior (12). Eating disorders are serious health concerns that have complex causes. Although it has not been officially recognized as an eating disorder by American Psychiatric Association (2013), Orthorexia Nervosa (ON) is characterized by a pathological obsession about consuming biologically pure food, leading to significant dietary restrictions. In developed countries, new eating behavior disorders such as bigorexia and orthorexia have emerged (13). ON has been described by Bratman (14, 15) for the first time in 1997 as a pathological fixation of consuming foods thought to be "healthy" (14). Orthorectics may prefer to starve rather than consuming food they perceive as unnatural and unhealthy (1). They are also anxious about the food processing methods and ingredients used and refuse to consume different kinds of impure food depending on their content and production procedures (13), as they think that those food contain herbicides, insecticides, or artificial substances as well as they are extremely anxious about the techniques and ingredients used for the preparation of the food. This obsession leads to loss of social relations and affective dissatisfaction, creating obsessive anxieties associated with food. The initial purpose of orthorectics is the wish to improve their health, treat their illness, or lose weight. Eventually, nutrition becomes the most important part of their lives (13). The original form of the ORTO-15 Likert type scale has been developed in Italy to assess the predisposition to Orthorexia Nervosa as a 15-item self-assessment tool (16). In the Turkish version of the scale, the items with a higher statistical rate have been selected as much as possible,

resulting in 11 items in the final version of the scale. Therefore, the scale has been decided to be named as (1) ORTO-11 in Turkish.

Since FDS and DPSS-R are new scales in the literature, this study is primarily aimed to assess whether food disgust, disgust propensity and sensitivity, and ON have a relationship for the first time. In pursuit of this goal, we tried to determine the prevalence of food disgust and disgust propensity on ON tendencies and their relationship with gender, body mass index, and selected socio-demographic data amongst young people for the first time.

Hypotheses of this study are listed below:

1) There is an association between FDS, DPSS-R, and ORTO-11.
2) The FDS, DPSS-R, and ORTO-11 scales are associated with gender and BMI.
3) FDS and DPSS-R scores are higher and ORTO-11 scores are lower in women than in men.
4) The FDS, DPSS-R, and ORTO-11 scale are associated with demographic variables (presence of any illness, smoking, or alcohol usage status).

2. Materials and Methods

2.1 Study sample

The study was conducted between April and May 2020 on university students determined by "random" sampling. The sample of the data was selected from two Universities in Istanbul and Kirklareli. 300 indi-viduals included in the study, composed of 199 (66%) males and 101 (34%) females. The mean age of the study participants was 24.28 ± 6.60 years. The data of 300 participants were analyzed, who voluntarily agreed to complete the scale and who responded to all items in the scale completely. After obtaining consent from the University Management, all three parts of the survey and a consent form were admitted. Permission was obtained from the study participants who were ad-ministered the questionnaires and from the owners of the scales before commencing the study. An analysis of power resulted in a sample size of 300 assuming a 95% confidence interval at a significance level of α=0.05.

Data were collected at 3 stages.

i A questionnaire including age, gender, BMI, and some demographic characteristics (8 items).
ii Food Disgust Scale (32 items)
iii ORTO-11 scale (11 items)
iv DPSS-R scale (15 items)

2.2 Measuring Tools

Data Form for Socio-Demographic Characteristics of The Individuals Participating in The Study

It is a data collection form consisting of 8 questions that were developed by the researchers. This form provides information about the individuals participat-ing in the study on the following domains including the demographic information (gender, level of edu-cation, marital status, occupation), anthropometric measurements (height, body weight, body mass index -BMI-), health status information (presence of any ill-ness, smoking or alcohol usage).

At the beginning of the study, a pilot study was conducted on 50 participants. Minor revisions were performed in the questions of the form to make them more comprehensible. Individuals who agreed to par-ticipate in the study had 15 minutes to answer the questionnaire while being seated in a comfortable po-sition. Participants were informed about the subject and purpose of the study. Each adult signed a volun-tary participation form and filled in the questionnaires in compliance with the Helsinki Declaration (World Medical Association, 2013).

2.3 The Food Disgust Scale (FDS)

The Food Disgust Scale developed by Hartmann et al. (2018) and a 32-item model built on eight sub-scales were used in the study. The revised 32 items have been assessed on a 6-point Likert-type scale ranging from 1 (not disgusting at all) to 6 (extremely disgusting) (4). The highest and the lowest food dis-gust predisposition scores of the scale are 192 and 32, respectively. Factors representing the sub-scales of the Food Disgust Scale consist of eight items, which are

animal flesh (4 items), poor hygiene (5 items), human contamination (4 items), mold (4 items), decaying fruits (4 items), fish (4 items), living contaminants (3 items), and decaying vegetables (4 items) (4). Studies suggest that disgust sensitivity may be a "risk factor" for developing "anxiety disorders" as some patients with this type of disorder have high scores on the Disgust Scale (DS) (10). Although disgust is associated with many symptoms of obsessive-compulsive disorder (OCD), studies in the literature have largely focused on the specific association of this emotion with the OCD symptoms of getting dirty/contaminated (17). No revisions have been performed in the scoring, as all items in the scale were positive for the predisposition to food disgust. Thus, a food disgust score for each scale was obtained. Higher scores indicate higher food disgust sensitivity.

2.4 Orthorexia Nervosa Scale

ORTO-15 has been developed by Donini et al. (2005) by improving and revising the expressions in the 10-question Orthorexia short questionnaire developed by Bratman (2000). Some questions were excluded and some were added to this new form of the questionnaire. The items on the scale investigate the behaviors of individuals in selecting, purchasing, preparing, and consuming food, all of which are considered as healthy by the individuals themselves. The expressions in the items have been developed to assess both the emotional and rational aspects of the individuals. Accordingly, the items of the scale examine the following domains including the "cognitive-rational domain" (item 1, 5, 6, 11, 12, 14), "clinical domain" (item 3, 7, 8, 9, 15), and the "emotional domain" (item 2, 4, 10, 13) (1). Each expression is evaluated on a Likert type scale of 4. The scale requires the individuals to respond by marking either of the following including "always", "often", "sometimes", and "never" according to the expressions in each item by considering how they feel at which frequencies (1). The responses to the items are scored "1" if they differentiate orthorexia and the responses are scored "4" if they indicate a normal eating behavior. The items indicating a contradiction to orthorexia in the scale are scored as 4-3-2-1. "Lower" scores indicate a predisposition to orthorexia. In the final version of the scale are the items 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, and 14 (Scoring of the items are presented in the appendix). In the validity study, Donini et al. (2005) tested different cut-off points and demonstrated that when the cut-off point was 40, the prediction capacity of the scale was higher, allowing for differentiating the individuals with a predisposition to orthorexia. The study conducted to adapt the scale in Turkish found the Cronbach's alpha coefficient 0.62 in the 11-item version (1).

2.5 Disgust Propensity and Sensitivity Scale-Revised (DPSS-R)

In our study, van Overveld et al.'s 16-item DPSS-R scale was used. A 5-point Likert-type questionnaire was prepared for the 16-item scale. Thus, each participant responded to each item in five subscales of "1-None 2-Rarely 3-Sometimes 4-Often 5-Always". Since all items were positive for the disgust tendency found in the survey, the scoring was not changed. Thus, a disgust tendency score was obtained for each questionnaire. A higher score indicates a high tendency to disgust. The scale consisting of two subfactors includes items 1, 5, 6, 7, 9, 10, 12, 14 for disgust tendency and items 2, 3, 4, 8, 11, 13, 15, 16 for disgust sensitivity. Internal consistency is given for Cronbach $\alpha = .78$ propensity and $\alpha = .79$ sensitivity. The most recent papers tend to use the 12-item version rather than the 16-item version (18).

2.6 Anthropometric Measurements

All measurements were performed by trained dieticians. Height was measured in the standing position by a stadiometer while the individuals were not wearing shoes. The height was measured to the nearest 0.1 cm. When measuring the height, the subjects and the controls stood straight with the head positioned such that the Frankfurt plane was horizontal, feet together, knees straight and heels in contact with the vertical surface of the wall, arms hanging freely at the sides with the palm facing the thighs. Participants' weights were measured by the equipment to the nearest 0.1 kg in light clothing and without shoes. All measurements were taken in the morning after a period of overnight

fasting. The BMI was calculated as weight (kg)/height $(m)^2$. Participants were classified according to their BMI into three groups as underweight (BMI < 18.5 kg/m^2), normal weight (18.5 ≤ BMI ≤ 24.9 kg/m^2), and overweight (25.0 ≤ BMI ≤ 29.9 kg/m^2). The BMI classification was made according to the definition made by the World Health Organization (WHO) (19).

2.7 Data Analysis

The normal distribution control was checked using the Shapiro-Wilk test. Independent samples t-test and one-way analysis of variance were used in group comparisons. The relationship between quantitative variables was examined by Pearson's correlation coefficient and the relations between qualitative variables were investigated by chi-square tests. Both univariate and multivariate linear regression analyses were used to determine the influential factors of FDS. Descriptive statistics are given as mean and standard deviation. The significance level was determined as 0.05 in all statistical analyses. Statistical analyses were performed by TURCOSA (Turcosa Analytics Ltd Co, Turkey, www.turcosa.com.tr).

3. Results and Discussion

There was no significant difference in age between women (23.53 ± 5.55) and men (24.66 ± 7.07) (p = 0.162). There was a significant difference between men and women in BMI (p <0.001). The mean BMI of men (23.88 ± 3.31) was significantly higher than that of women (21.64 ± 3.50). There was no significant difference in FDS between women (115.14 ± 24.22) and men (112.09 ± 29.89) (p = 0.342). In terms of DPSS-R, a significant difference was found between men and women (p <0.004). The mean DPSS-R of women (51.09 ± 12.49) was significantly higher than that of men DPSS-R scores (46.67 ± 12.21). There was no significant difference in ORTO-11 between women (23.89 ± 3.88) and men (24.60 ± 4.27) (p = 0.163).

No significant difference was found between the body mass index categories in terms of FDS (p = 0.201). There was no significant difference between the body mass index categories in terms of ORTO-11 (p = 0.053). In terms of DPSS-R, a significant difference was found between body mass index categories (p = 0.002). The mean DPSS-R in the underweight category (59.92 ± 9.96) was significantly

Table 1. FDS, DPSS-R and ORTO-11 scale scores according to gender (n=300)

	Male (n=199)	**Female (n=101)**	**p-value**
Age (year)	24.66±7.07	23.53±5.55	0.162
BMI (kg/m^2)	23.88±3.31	21.64±3.50	<0.001
FDS	112.09±29.89	115.14±24.22	0.342
DPSS-R	46.67±12.21	51.09±12.49	0.004
ORTO-11	24.60±4.27	23.89±3.88	0.163

Table 2. FDS, DPSS-R and ORTO-11 scale scores according to BMI (kg/m^2) (n=300)

Scores	**Underweight (n=12) < 18.5 kg/m^2**	**Normal (n=218) 18.5-24.9 kg/m^2**	**Overweight (n=70) ≥25.0 kg/m^2**	**p-value**
FDS	118.92±17.29	111.33±29.02	117.66±26.27	0.201
DPSS-R	59.92±9.96	48.10±12.37	46.33±12.17	0.002
ORTO-11	25.42±3.63	24.00±3.90	25.29±4.80	0.053

higher in both the normal category (48.10 ± 12.37) and the overweight category (46.33 ± 12.17) (p values 0.004 and 0.001, respectively).

When the results are examined in terms of working status; while there was no significant difference between FDS and DPSS-R (p = 0.501 and 0.053, respectively), there was a significant difference in ORTO-11 (p = 0.001). THE mean ORTO-11 score of the workpeople (25.84 ± 4.84) was found to be significantly higher than the non-workers (23.97 ± 3.86).

When the results are examined in terms of marital status; while there was no significant difference between married and singles in terms of FDS and DPSS-R (p values 0.654 and 0.284, respectively), a significant difference was found in ORTO-11 (p = 0.010). The mean score of ORTO-11 (26.03 ± 5.21) was significantly higher in the married group than the single (24.13 ± 3.94).

When the results are examined in terms of the presence of the disease; there was no significant difference between FDS, DPSS-R, and ORTO-11 (p = 0.266, 0.124, 0.270).

Examining the results in terms of smoking; while there was no significant difference in FDS between smokers and non-smokers (p = 0.709), there was a significant difference in terms of DPSS-R and ORTO-11 (p values 0.002 and 0.009, respectively). The DPSS-R score (44.52 ± 13.07) of the smokers was significantly lower than the non-users (49.58 ± 11.93), while the ORTO-11 score of the smokers (25.49 ± 3.83) was significantly higher than the non-users (24.07 ± 4.14).

Examining the results in terms of alcohol usage; there was no significant difference between FDS and ORTO-11 (p = 0.636 and 0.121, respectively) and DPSS-R (p = 0.009). The DPSS-R score of the alcohol users (43.41 ± 12.28) was significantly lower than the non-users (48.91 ± 12.35).

As a result of simple linear regression analysis performed for DPSS-R, the female gender increased DPSS-R by 4.42 units in comparison to the male gender (p = 0.004). It was found that being at low weight increased the DPSS-R score by 11.82 units compared to normal weight (p = 0.001). Smoking reduced the DPSS-R score by 5.06 units (p = 0.002). Alcohol use

Tablo 3. Comparison of sociodemographic variables with the total score of the three scales

	FDS	DPSS-R	ORTO-11
Working status			
Yes (n=63)	110.62±34.51	45.46±11.98	25.84±4.84
No (n=237)	113.78±26.19	48.87±12.51	23.97±3.86
p-value	0.501	0.053	0.001
Marital status			
Married (n=36)	111.14±30.84	46.588.71	26.035.21
Single (n=264)	113.38±27.77	48.37±12.88	24.13±3.94
p-value	0.654	0.284	0.010
Presence of a chronic disease			
Yes (n=28)	118.75±25.89	51.61±11.12	23.54±4.32
No (n=272)	112.53±28.31	47.80±12.55	24.44±4.13
p-value	0.266	0.124	0.270
Smoking status			
Smoker (n=75)	111.71±28.04	44.52±13.07	25.49±3.83
Non-smoker (n=215)	113.12±28.28	49.58±11.93	24.07±4.14
p-value	0.709	0.002	0.009
Alcohol use			
Yes (n=41)	115.05±19.83	43.41±12.28	25.29±4.49
No (n=259)	112.81±29.22	48.91±12.35	24.21±4.06
p-value	0.636	0.009	0.121

Table 4. Effects of some properties, DPSS-R and ORTO-11 scale scores on FDS scale scores

Variable	Univariate Analysis			Multivariate Analysis		
	DPSS-R	ORTO-11	FDS	DPSS-R	ORTO-11	FDS
	Beta (p-value)	Beta (p-value)	Beta (p-value)	Beta (p-value)	Beta (p-value)	Beta (p-value)
Gender (Female)	4.42 (0.004)	-0.71 (0.163)	3.05 (0.375)	1.39 (0.319)	-0.34 (0.518)	-
Age (year)	-0.0001 (0.468)	0.0001 (0.027)	-0.0003 (0.175)	-	0.0001 (0.009)	-0.0006 (0.017)
BMI						
Normal	-	-	-	-	-	-
Underweight	11.82 (0.001)	1.41 (0.249)	7.58 (0.363)	9.05 (0.006)	2.34 (0.058)	-5.65 (0.455)
Overweight	-1.77 (0.294)	1.28 (0.024)	6.32 (0.102)	-1.51 (0.327)	0.78 (0.178)	8.53 (0.019)
Presence of illness	3.81 (0.124)	-0.91 (0.270)	6.21 (0.266)	2.46 (0.265	-	-
Smoking	-5.06 (0.002)	1.43 (0.009)	-1.41 (0.709)	-2.75 (0.073)	1.01 (0.078)	-
Alcohol	-5.49 (0.009)	1.08 (0.121)	2.24 (0.636)	-4.27 (0.027)	0.73 (0.310)	-
ORTO-11	-0.43 (0.014)	-	-0.116 (0.768)	-0.28 (0.072)	-	-
FDS	0.20 (<0.001)	-0.0025 (0.768)	-	0.193 (<0.001)	-	-
DPSS-R	-	-0.047 (0.014)	1.006 (<0.001)	-	-0.035 (0.075)	1.04 <0.001)

decreased the DPSS-R score by 5.49 units (p = 0.009). One unit increase in the ORTO-11 score decreased the DPSS-R score by 0.43 units (p = 0.014). It has been found that one unit increase in FDS scores increased the DPSS-R score by 0.20 units (p <0.001).

As a result of simple linear regression analysis for ORTO-11; a 10-year increase in age increased the ORTO-11 score by 0.001 units (p = 0.027), being overweight increases ORTO-11 score by 1.28 units compared to normal weight (p = 0.024), smoking increased ORTO-11 score by 1.43 units (p = 0.009), one unit increase in the DPSS-R score decreases ORTO-11 score by 0.047 units (p = 0.014).

As a result of the simple linear regression analysis for FDS; it was found that only one unit increase in the DPSS-R score increased the FDS score of 1.006 units (p <0.001). As a result of simple linear regression analysis, variables with p values of 0.20 and below for all three scales were included in the multivariate regression model and the regression model analyzed.

As a result of multivariate linear regression analysis for DPSS-R; the underweight category increases the DPSS-R score by 9.05 units compared to normal weight (p = 0.006), alcohol use decreased the DPSS-R score by 4.27 units (p = 0.027), one unit increase in FDS score increased DPSS-R score by 0.193 units (p <0.001).

As a result of multivariate linear regression analysis for ORTO-11; only the 10-year increase in age increased the ORTO-11 score by 0.001 units (p = 0.009).

As a result of multivariate linear regression analysis for FDS; a 10-year increase in age reduced the FDS score by 0.006 units (p = 0.009), being overweight increased FDS score by 8.53 units compared to normal weight (p = 0.019), smoking reduced the DPSS-R score by 5.06 units (p = 0.002), alcohol use decreased the DPSS-R score by 5.49 units (p = 0.009), one unit increase in DPSS-R score increased FDS score 1.04 units (p <0.001)

Correlations between age, body weight, BMI, smoking duration, smoking frequency, and alcohol usage and ORTO-11, DPSS-R, and FDS were studied. According to the results, the relationships between variables and scale scores were found to be meaningless or very weak. Therefore, it was concluded that there was no statistically significant relationship between the variables mentioned and the scale scores.

Tablo 5. Correlation between total score of the three scales and other variables (n=300)

	ORTO-11	DPSS-R	FDS
	Correlation (p value)	**Correlation (p value)**	**Correlation (p value)**
Age (year)	0.10 (0.078)	-0.025 (0.675)	-0.12 (0.037)
Weight (kg)	0.07 (0.242)	-0.17 (0.004)	-0.06 (0.350)
BMI (kg/m2)	0.03 (0.574)	-0.12 (0.041)	-0.04 (0.504)
Smoking duration (year)	-0.05 (0.649)	-0.02 (0.877)	-0.15 (0.195)
Smoking frequency (piece/day)	-0.05 (0.665)	-0.005 (0.966)	-0.16 (0.171)
Alcohol use frequency (ml/week)	0.04 (0.484)	-0.14 (0.02)	0.07 (0.245)
ORTO-11	-	-0.19 (0.001)	-0.06 (0.333)
DPSS-R	-0.19 (0.001)	-	0.45 (<0.001)
FDS	-0.06 (0.333)	0.45 (<0.001)	-

When the correlation coefficients of the scale scores are examined; only FDS and DPSS-R were found to be positive, moderate, and statistically significant (r = 0.45, p <0.001).

When the correlation between the total scores of the orthorexia scale, DPSS-R and FDS were examined, the only FDS and DPSS-R were found to be positive, moderate, and statistically significant (r = 0.45, p <0.001). Further in the study, the association of food disgust sensitivity to socio-demographic variables and the predictive factors including diseases were studied. The present study was conducted among university students of health sciences in Turkey.

Orthorexia Nervosa is a new concept in eating disorders and results from an obsession with the quality of food intake. Being obsessed with certain types of food, loss of control, and losing the balance accompanied by withdrawal from life may lead to orthorexia. Often hidden behind a very deep belief, which is perceived as being attractive, the causes of orthorexia may mimic a deceptive willingness for health, removing the pathological risks (14). Arusoglu et al. (2008) conducted a validity and reliability study and did not find out any significant effects of BMI on the tendency to orthorexia. Similarly, it has been observed that the mean scores obtained from males are higher meaning that their predisposition to orthorexia may be lower (1). This finding is associated also with the predisposition and susceptibility to develop diseases in older individuals (20). However, the nature and the cause of food disgust sensitivity occurring at higher rates in females have not been established yet. A study has reported evidence showing that sex hormones were associated with disgust sensitivity (21). A study conducted by Ammann et al. (2018) has proposed that gender differences in terms of disgust sensitivity are associated with fertility and occur as a defensive mechanism preventing infections since females are exposed to pathogens more, compared to males, during bringing up children. Studies indicate that gender, BMI, age, and education level can be part of etiology. The effect of gender was evaluated in various studies.

Sanlier et al. (2016) found out that predisposition to orthorexia occurred at a higher extent in females compared to males (p<0.05) (22). A study conducted on university students (n= 207) studying either sports sciences or management in Sweden found a lower degree of predisposition to orthorexia in females compared to males (23). A study by Stochel et al. (2015) did not find out a significant difference between the two genders (24). It is unclear whether ON is more prevalent among women or men. Moreover, according to our study, the effect of no variable on FDS scores was statistically significant in both univariate and multivariate linear regression (all p values> 0.05) in nutrition and dietetic students.

Another study on disgust conducted by Berger et al. (2014) found out positive and negative associations

of age without ignoring the type of scale used and which group of individuals participated. Also, the income level and the education level is negatively associated with the predisposition to food disgust (25). Another study conducted by Ammann et al. on age found out contradicting results (20). The authors concluded that disgust sensitivity developed in the older age group to protect against food-borne diseases as the susceptibility and risk to catch diseases increase with increasing age (26).

Another study conducted on healthcare personnel (n=206) and their relatives who were not health care professionals (n=206) reported lower scores obtained from ORTO-15 (27). Another study found ORTO-15 scores 40 and over in 40% of the study participants. There was a significant correlation between the ORTO-15 scores of the two groups consisting of individuals with previous training on healthcare in one group and individuals without healthcare training in the other group (respectively, 37.84±6.53 and 40.9±7.02 points) (28). In our study, health sciences students tended ON with 33 points and lower according to the Turkish ORTO-11 scale used (95.28%). According to the ORTO-11 reliability and validity study, orthorectic tendency in the Turkey sample was at the cut off points 33 and lower (1). This cut-off point is used in the present study to determine orthorectic tendency.

Therefore, that study has disregarded the association between the food disgust and the experiences of foodborne diseases. It should be further studied whether foodborne diseases are the causes or results of food disgust sensitivity at variable degrees. The study conducted by Egolf et al. (2018) demonstrated a significant correlation among several variables, including the total score of FDS, age, education level, income level, having a sensitive stomach, and gastrointestinal complaints. Higher FDS scores were obtained in older individuals compared to the younger ones. This means that age is correlated directly.

Our study may suggest that food disgust sensitivity decreases in females with increasing age. The study conducted by Egolf et al. (2018) has reported that food disgust sensitivity may be affected by the experiences of foodborne diseases and by the gastrointestinal complaints emerging after eating a certain food. Disgust associated with the taste of food may cause nausea (29). In our study, there was not a significant association between the reported disease status of the individuals and the total scores of FDS. This finding may be associated with including study participants from a healthy population and with collecting a lesser amount of data on disease status.

Food disgust may be affected by several socioeconomic factors like age and gender, and by gastrointestinal complaints.

In our study, the mean DPSS-R in the underweight category (59.92 ± 9.96) was significantly higher in both the normal category (48.10 ± 12.37) and the overweight category (46.33 ± 12.17) (p values 0.004 and 0.001, respectively). That means that underweight people are more disgust sensitive. As a result of simple linear regression analysis performed for DPSS-R, female gender increased DPSS-R by 4.42 units according to the male gender ($p = 0.004$). It was found that being at low weight increased the DPSS-R score by 11.82 units compared to normal weight ($p = 0.001$). Smoking reduced the DPSS-R score by 5.06 units ($p = 0.002$) and alcohol use decreased the score by 5.49 units ($p = 0.009$).

The studies on Orthorexia Nervosa summarize the following factors associated with the predisposition to orthorexia including gender, the level of education, the status of being on a weight loss diet, an obsessive status (28), being overweight, participating in workouts, being a smoker, a high-income level, the employment status of the parents (24), the status of having an attitude to follow diets, and the news on health and eating (30) in the media. Furthermore, several factors including but not limited to the worries on appearance socially, the behavioral patterns on a healthy lifestyle, and food disgust may be argued to be associated with a predisposition to orthorexia.

4. Conclusions and Recommendations

Depending on the geographical locations, the attitude of individuals against food may be different remarkably. Further studies need to be conducted to determine which type of food increases the disgust

sensitivity. Furthermore, the attention of healthcare professionals should be received (dietitians, nurses, physicians, etc.) on this issue, obsessive worries should be identified in individuals with a predisposition to food disgust. A further step after this study should be to study whether food disgust sensitivity is associated with having a susceptible stomach or having frequent spells or sustained experiences with problems associated with digestion. For the next step, we recommend determining a cut-off point for the FDS scale.

Limitations

The limitations of this study should be noted. This is the first study conducted on this subject.

First, the study sample consists of individuals coming from a limited region. Second, the sample does not represent all university students studying in different regions. Therefore, the results should not be generalized to the entire country. Further studies should be conducted by including a higher number of students attending high school, college, and by including adults of all ages as well. Further studies conducted on individuals representing various risk groups need to be conducted to elicit more reliable results. The limited number of studies on FDS, which has been developed in a new concept, highlights the need for further studies on this subject. Therefore, studies employing group interviews should be conducted on individuals with a predisposition to food disgust to test different variables.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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