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Nutritional knowledge as a protective factor against eating disorders and a risk factor for orthorexic tendencies

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TITLE PAGE

Title: Nutritional Knowledge as a Protective Factor Against Eating Disorders and a Risk Factor for Orthorexic Tendencies

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Sedat Arslan conceived the study, performed analyses, conducted the investigation, curated data, and wrote the draft. Hande Öngün Yılmaz contributed to study design, analyses, investigation, and drafting. Kevser Tarı Selçuk coordinated the investigation, contributed to analyses, data curation, visualization, and manuscript revision. Hatice Merve Bayram contributed to study design, data curation, and manuscript review. Arda Öztürkcan contributed to study design, data curation, and manuscript review. All authors approved the final version of the manuscript.

Ethics Approval and Consent to Participate
This study was conducted by the ethical principles of the Declaration of Helsinki and was approved by the Bandırma Onyedi Eylül University Health Sciences Non-Interventional Ethics Committee (Reference Number: 2024-132). Written informed consent was obtained from all participants before their inclusion in the study.

Nutritional Knowledge as a Protective Factor Against Eating Disorders and a Risk Factor for Orthorexic Tendencies

Abstract

This cross-sectional study examined the relationships among nutritional knowledge, eating disorder symptoms, orthorexia-related scores, and body satisfaction among Turkish adults. A total of 1,457 adults aged 19–64 years completed an online questionnaire including the

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Nutrition Knowledge Scale, Eating Attitudes Test-40, ORTO-11 Orthorexia Scale, and Body Satisfaction Scale. Descriptive statistics, Pearson correlation analyses, and hierarchical multiple regression analyses were conducted. The mean Nutrition Knowledge Scale score was 81.42 ± 17.61, and 46.3% of participants were classified as having low nutritional knowledge. After adjustment for demographic, health, and lifestyle covariates, higher nutritional knowledge was significantly associated with lower Eating Attitudes Test-40 scores ($\beta = -0.151$, $p < 0.001$), higher ORTO-11 scores ($\beta = 0.126$, $p < 0.001$), and higher Body Satisfaction Scale scores ($\beta = 0.133$, $p < 0.001$). These findings suggest that nutritional knowledge may be linked to fewer disordered eating symptoms and greater body satisfaction. However, interpretation of the ORTO-11 findings requires caution because lower ORTO-11 scores indicate greater orthorexia risk in the original scoring direction. Nutrition education programs should therefore promote accurate knowledge while also supporting flexible eating attitudes, positive body image, and psychological well-being. Future longitudinal studies using updated orthorexia assessment tools are needed to clarify causal pathways and the role of cultural and psychosocial mediators.

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Keywords: Nutritional knowledge, eating disorders, body satisfaction, orthorexia nervosa.

Introduction

Eating disorders are major public health problems that impose substantial physical, psychological, and economic burdens on individuals and health systems [1]. According to DSM-5, eating disorders include anorexia nervosa, bulimia nervosa, and binge eating disorder, characterized by persistent disturbances in eating behavior, attitudes toward food, and weight/shape preoccupation [2-4]. Beyond these clinical conditions, body satisfaction, a central component of body image, has been identified as a critical psychological factor influencing eating behaviours and overall well-being. [2]. Low body satisfaction or body dissatisfaction, does not constitute an eating disorder itself, but represent a vulnerability

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factor that can increase the likelihood of maladaptive eating patterns while also affecting social, emotional, and physical health outcomes [5].

In Turkish society, food culture powerfully shapes eating behaviors and social bonds. Within this context, the influence of individuals' nutritional knowledge is complex and multifaceted. Nutritional knowledge is a key determinant of food choices and diet quality and can guide health behaviors across the life course [6-8]. A healthy diet can be defined as adequate and balanced intake of energy, macronutrients, and micronutrients, with emphasis on diversity and moderation of sugar, salt, saturated fats, and ultra-processed products [9]. In contrast, an unhealthy diet features nutrient imbalances, energy excesses or deficits, and frequent reliance on energy-dense, low-nutrient processed foods [10]. Accordingly, assessing nutritional knowledge is essential for understanding changes in dietary habits and practices at the population level [11].

In Turkish society, food culture is not only a matter of sustenance but also a central marker of social identity and hospitality. Meals are embedded in family gatherings and community rituals, where sharing food symbolizes abundance and togetherness [12]. This emphasis on communal eating distinguishes Türkiye from Western societies, where eating is often individualized and shaped by convenience [11]. Yet, urbanization and global media have introduced processed foods and appearance-focused ideals that increasingly reshape traditional practices [5]. Consequently, Turkish adults face dual pressures: while Mediterranean-based staples such as legumes, olive oil, and fermented dairy encourage dietary balance, rich desserts and sociocultural expectations of abundance coexist with modern thinness ideals. This paradox has been linked to orthorexic tendencies and body dissatisfaction in local populations [13-15]. Compared with European or North American groups, Turkish adults experience a unique intersection of traditional abundance culture and

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contemporary restriction pressures, which makes the examination of nutrition knowledge in this setting both culturally specific and globally relevant [16].

However, greater knowledge does not invariably yield healthier outcomes; in some individuals, heightened focus on nutrition may coincide with obsessive tendencies, rigid dietary rules, and overcontrolled eating patterns that elevate the risk for disordered eating [12,17]. This dynamic is particularly visible in orthorexia nervosa, a condition not formally recognized in DSM-5 but widely described as an excessive preoccupation with “healthy eating”.Orthorexic tendencies can cause psychosocial impairment and reduced quality of life. Evidence suggests that higher nutritional knowledge and dieting interest are sometimes associated with elevated orthorexic risk [12,18]. Although orthorexic behaviors are often thought to be unrelated to body image, recent studies challenge this view, showing that body dissatisfaction may also contribute to the development of orthorexic symptoms [5,14]. These findings emphasize the importance of designing nutrition education programs that balance factual knowledge with psychological safeguards, encouraging flexible and balanced eating rather than rigid, rule-based practices [9,10].

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Nutritional knowledge can therefore function as a double-edged construct. On one hand, lower knowledge levels are associated with inaccurate dietary practices and suboptimal diet quality [21,22]. On the other hand, high or narrowly focused knowledge may, in vulnerable individuals, fuel perfectionism, orthorexic tendencies, and maladaptive control over eating [16, 23]. Moreover, the broader sociocultural environment—particularly appearance-ideal internalization and social comparison processes amplified by digital media—can intensify body-related pressures and interact with knowledge to shape eating attitudes and behaviors [24, 25].

The role of body satisfaction is especially important in this context. Positive body evaluations are associated with healthier eating and psychological well-being, whereas dissatisfaction can

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undermine these outcomes [15, 26]. Evidence on the relationship between nutritional knowledge and body satisfaction is mixed: some studies report that knowledge supports healthier choices and may foster more positive body evaluations, especially when coupled with skills and self-efficacy [12, 27], whereas others indicate that, for certain individuals, increased knowledge can heighten weight/shape preoccupation and dissatisfaction [21, 28]. Given these complexities, it is essential to clarify how nutritional knowledge relates to eating disorder symptoms and body satisfaction in culturally specific contexts. The present study aimed to investigate the relationships among nutritional knowledge, eating disorders, and body satisfaction in Turkish adults, with a focus on how nutritional knowledge influences healthier behaviors and attitudes. It is hypothesized that higher nutritional knowledge will be associated with fewer eating disorder symptoms. Furthermore, higher nutritional knowledge is expected to be associated with greater body satisfaction. Finally, it is hypothesized that higher nutritional knowledge will be associated with greater orthorexic tendencies.

Materials and Methods

Study design and sample

This cross-sectional study was conducted among adults aged 19–64 years residing in Türkiye. The minimum required sample size was calculated using G*Power 3.1.9.7 with 95% power, a significance level of $\alpha=0.05$, and an effect size of $d=0.10$, yielding a target of 1289 participants [29, 30]. Anticipating a 20% attrition rate, the target recruitment was set at 1547 participants. A nonprobability sampling approach, combining chain-referral (snowball) and convenience sampling, was employed. Between August and September 2024, 1565 adults were recruited via social media and group messaging applications. Inclusion criteria were: age 19–64 years, residence in Türkiye, voluntary participation, and completion of the online questionnaire. Exclusion criteria were: diagnosed psychiatric illness (n=3), inability to meet nutritional needs orally and/or chewing/swallowing difficulties (n=1), following a prescribed

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diet under the supervision of a dietitian (n=26), diagnosed food allergies or intolerances (n=43), previously diagnosed eating disorders (n=2), and current pregnancy or lactation (n=33). After applying these criteria, the final analytic sample comprised 1457 participants.

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Bandırma Onyedi Eylul University Health Sciences Non-Interventional Research Ethics Committee (Reference Number: 2024-132). All participants provided written informed consent prior to participation.

Data collection instruments

Data were collected via an online questionnaire comprising five sections: (1) General Information Form, (2) Nutrition Knowledge Scale (NKS), (3) Eating Attitudes Test-40 (EAT-40), (4) ORTO-11 Orthorexia Scale, and (5) Body Satisfaction Scale (BSS).

All instruments used in this study demonstrated acceptable reliability in the Turkish population. The Nutrition Knowledge Scale (NKS) [31] has shown good internal consistency, with Cronbach's α values above 0.80 in previous studies. The Eating Attitudes Test-40 (EAT-40) [32]; Turkish validation by Savaşır & Erol [33] demonstrated strong psychometric properties, with Cronbach's α exceeding 0.85. The ORTO-11 scale, adapted into Turkish by Arusoğlu et al., [35] has shown Cronbach's α 0.76, supporting its internal reliability in assessing orthorexic tendencies. The Body Satisfaction Scale (BSS) [36]; Turkish validation by Bakalım & Taşdelen-Karçkay [37] yielded Cronbach's α values above 0.85, indicating robust reliability.

General Information Form. Developed by the researchers, this section assessed sociodemographic characteristics (age, sex, education, employment, and income), health status, physical activity, dietary habits, and anthropometric measurements (self-reported height and body weight). Body mass index (BMI) was calculated as weight (kg)/height (m^2).

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Although measurement was suggested, for standardization in the online format, self-reported values were used.

Nutrition Knowledge Scale (NKS). The NKS, developed by Öngün Yılmaz et al. [31], is a 31-item, five-point Likert-type instrument assessing knowledge in three domains: (i) nutrients and nutrient properties, (ii) food preparation and cooking methods, and (iii) nutrition–health relationships. Items are scored from 0 (strongly disagree) to 4 (strongly agree), with ten items (1, 5, 6, 9, 10, 16, 17, 21, 27, 28) reverse-scored because they represent misinformation. Total scores range from 0 to 126, with higher scores indicating greater nutritional knowledge. The original classification is low (≤79), moderate (80–90), high (91–100), and very high (≥101). In this study, participants were grouped as low (≤79), medium (80–90), or high (≥91) knowledge. Cronbach's alpha in this study was 0.88.

Eating Attitudes Test-40 (EAT-40). Developed by Garner and Garfinkel [32], the EAT-40 assesses symptoms associated with eating disorders (e.g., anorexia nervosa, bulimia nervosa, and related restrictive patterns). The 40 items index eating attitudes, weight-control behaviors, and body-related cognitions. The Turkish adaptation by Savaşır and Erol [33] demonstrated strong validity and reliability. In the 6-point Likert-type scale, the response options range from Always to Never. For items numbered 1, 18, 19, 23, 27, and 39, the option Sometimes is scored as 1 point, Rarely as 2 points, and Never as 3 points, while all other options receive 0 points. For the remaining items, the options Always, Very Often, and Often are scored as 3, 2, and 1 points, respectively, while all other options receive 0 points. In line with conventional practice, higher scores reflect greater risk for disordered eating, and scores ≥30 indicate clinical risk [33]. In this study, Cronbach's alpha was 0.89 for the "diyeting behavior" subscale, 0.77 for "Oral Control", 0.82 for "Food Preoccupation", 0.82 for "Body Image", and 0.93 overall.

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ORTO-11 Orthorexia Scale. Developed by Donini et al. [34], this 11-item scale assesses obsessive behaviors and thoughts regarding healthy eating (orthorexia nervosa). Items are scored on a 4-point Likert scale (1 = Never, 2 = Sometimes, 3 = Often, 4 = Always), with lower scores reflecting greater orthorexic tendencies in the original version. The Turkish validation by Arusoğlu et al. [35] confirmed adequate psychometric properties (Cronbach's alpha = 0.81). Nevertheless, it should be noted that ORTO-11 is a shortened derivative of the original ORTO-15, and both instruments have been increasingly criticized for weak psychometric performance, unstable factor structure, and conceptual limitations. Despite these concerns, ORTO-11 was selected in the present study because of its extensive prior use in Turkish samples, allowing for comparability with existing data. Its limitations are acknowledged, and findings based on this instrument should be interpreted with caution. For consistency, the present study maintained the original scoring direction; lower scores indicate higher orthorexia risk. Cronbach's alpha in this study was 0.80.

Body Satisfaction Scale (BSS). Originally developed by Avalos et al. [36] and adapted into Turkish by Bakalım and Taşdelen-Karçkay [37], this 9-item scale evaluates two factors: "investment in body image" and "body satisfaction". Items are rated on a 5-point Likert scale (1 = never, 5 = always), with higher scores reflecting greater satisfaction. Confirmatory factor analysis in the Turkish adaptation supported the two-factor model with acceptable fit indices (GFI=0.92, CFI=0.93, RMSEA=0.11 for women; GFI=0.91, CFI=0.93, RMSEA=0.11 for men). In this study, Cronbach's alpha was 0.89 for the Investment in body perception subscale, 0.87 for Body satisfaction, and 0.89 overall.

Scale copyright and permission statement. The four instruments used in this study were the Nutrition Knowledge Scale, Eating Attitudes Test-40, ORTO-11 Orthorexia Scale, and Body Satisfaction Scale. These instruments were used for non-commercial academic research purposes in accordance with their published descriptions and Turkish validation studies. To

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the best of our knowledge, none of the scales used in this study required a separate copyright licence or written permission for academic use. No item-level reproduction beyond what was necessary for scale administration was included in the manuscript, and no modifications were made to the original scoring procedures except for the classification/grouping procedures explicitly described in the Methods section.

Data analysis

The data were evaluated via the SPSS 26.0 statistical package program. Descriptive statistics (number, percentage, mean, and standard deviation) were calculated for data analysis. The suitability of the distribution for a normal distribution was evaluated with kurtosis and skewness coefficients, and variables with kurtosis and skewness coefficients in the range of -1 and +1 were considered suitable for a normal distribution. The linear relationship between nutritional knowledge level and eating disorders and body satisfaction was analyzed via Pearson correlation analysis. Hierarchical multiple regression analyses were conducted to examine the relationship between nutrition knowledge and eating disorders (EAT-40 and ORTO-11) and body satisfaction. Covariates were selected based on both theoretical relevance in prior research and preliminary analyses showing associations with the dependent variables. Variables were entered in three steps. Step 1 included demographic covariates (age, sex, marital status, educational level, employment status, and perceived income level), Step 2 included health and lifestyle covariates (chronic disease, smoking, alcohol consumption, physical activity, sleep duration, and BMI), and Step 3 included nutrition knowledge to assess its unique contribution after controlling for all covariates. Categorical variables were dummy coded (0=reference, 1=comparison). Regression assumptions including multicollinearity (VIF < 4), normality, linearity, and independence of residuals (Durbin-Watson: 1.5-2.0) were examined and found to be satisfactory. Model explanatory power was evaluated using R^2 and ΔR^2, and the significance of ΔR^2 was tested using the F-change

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statistic. The level of significance for all statistical tests was set at $p < 0.05$.

Results

The mean age of the participants was 30.97±10.83 years, 44.1% were between the ages of 25 and 44, 37.1% were married, 76.8% had a university degree or higher, 53.7% were employed in any income-generating job, and 23.4% stated that their income was less than their expenses. A total of 11.4% of the participants stated that they were diagnosed with at least one chronic disease. The proportions of participants who reported smoking and alcohol consumption were 35.2% and 39.0%, respectively. The proportion of participants who engaged in at least 150 minutes of moderate physical activity per week was 33.0%. A total of 51.6% of the participants consumed 3 main meals a day. The average daily sleep duration of the participants was 7.47±3.91 hours. The mean body weight, height, and BMI of the adults were 70.60±16.23 kg, 170.27±11.24 cm, and 24.48±7.61 kg/m2, respectively (Table 1).

Table 1. ***Descriptive characteristics of the participants (n= 1457)***

Descriptive characteristic	**Number (n)**	**Percentage (%)**	**M(SD)**
Age (years)			30.97 (10.83)
19-24	597	41.0	
25-44	643	44.1	
45-64	217	14.9	
Sex			
Female	840	57.7	
Male	617	42.3	
Marital status			
Married	541	37.1	
Single	916	62.9	
Level of education			
High school and below	338	23.2	
University and above	1119	76.8	
Employment status			
Yes	782	53.7	
No	675	46.3	
Perceived income level			
Income less than expenditure	318	23.4	
Income equal to expenditure	628	46.1	
Income more than expenditure	415	30.5	
Chronic disease			
No	1291	88.6	

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Yes	166	11.4	
Smoking status			
Current smoker	513	35.2	
Nonsmoker	944	64.8	
Alcohol intake status			
Yes	568	39.0	
No	889	61.0	
Physical activity status			
Yes	481	33.0	
No	976	67.0	
Number of main meals per day			
≤2	538	36.9	
3	752	51.6	
≥4	167	11.5	
Sleep duration (h)			7.42 (1.32)
Body weight (kg)			70.60 (16.33)
Height (cm)			170.27 (11.24)
BMI (kg/m^2)			24.48 (7.61)

Note. Values are presented as frequencies and percentages unless otherwise indicated. M = mean; SD = standard deviation; BMI = Body mass index.

The mean nutritional knowledge scale score of the adults was 81.42±17.61. Considering the cutoff point of the scale, 46.3% of the adults had a low level of nutritional knowledge. The mean scores of the EAT-40, ORTO-11, Body Satisfaction Scale total, and General Body Satisfaction and Investing in Body Image subscales were 24.63±20.02, 26.78±5.63, 1.00±1.21, and 33.46±8.19, 26.16±6.39 and 7.30±2.08, respectively (Table 2).

Table 2. ***Scores of the participants on the nutrition knowledge level, EAT-40, ORTO-11, and BSS (n= 1,457)***

Scales	**M (SD)**	**Min–Max**	**% (n)**
Nutrition Knowledge Scale	81.42 (17.61)	28.00-124.00	
-Low			46.3 (674)
-Middle			22.4 (327)
-High			31.3 (456)
Eating Disorder	24.63 (20.02)	2.00-105.00	
Orthorexia	26.78 (5.63)	11.00-44.00	
Body Satisfaction Scale	33.46 (8.19)	9.00-45.00	
- Overall Body Satisfaction	26.16 (6.39)	7.00-35.00	
- Investing in Body Image	7.30 (2.08)	2.00-10.00	

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Note. Values are presented as mean (M) ± standard deviation (SD) and percentages where applicable. EAT-40 = Eating Attitudes Test. ORTO-11 = ORTO 11 Orthorexia Scale. BSS: Body Satisfaction Scale.

While the nutritional knowledge level of adults was significantly negatively and weakly associated with the EAT-40 score, it was significantly positively and weakly associated with the ORTO-11 total score, body satisfaction scale total score, general body satisfaction score and investment in body image subscale score (Table 3).

Hierarchical multiple regression results for eating disorder (EAT-40) are presented in Table 4. Step 1 explained R^2=0.010 of the variance (F-change=2.826, p=0.015). Step 2 added ΔR^2=0.018 (F-change=4.129, p<0.001). Step 3 accounted for an additional ΔR^2=0.021 (F-change=29.324, p<0.001), with nutrition knowledge (β =-0.151, p<0.001) emerging as a significant independent predictor (Table 4). Hierarchical multiple regression results for eating disorder (ORTO-11) are presented in Table 5. Step 1 explained R^2=0.032 of the variance (F-change=8.830, p<0.001). Step 2 added ΔR^2=0.018 (F-change=4.113, p<0.001). Step 3 accounted for an additional ΔR^2=0.015 (F-change=20.702, p<0.001), with nutrition knowledge (β =0.126, p<0.001) emerging as a significant independent predictor (Table 5). Hierarchical multiple regression results for eating body satisfaction are presented in Table 6. Step 1 explained R^2=0.027 of the variance (F-change = 6.027, p<0.001). Step 2 added ΔR^2=0.031 (F-change=7.065, p<0.001). Step 3 accounted for an additional ΔR^2=0.017 (F-change=24.297, p<0.001), with nutrition knowledge (β =0.133, p<0.001) emerging as a significant independent predictor (Table 6).

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Table 3. ***Associations of nutritional knowledge level with eating disorders and body satisfaction (n= 1,457)***

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1.NKS	81.42	17.61	-									
2.EAT-40	24.63	20.02	-0.128**	-								
3.Diyeting behavior	3.55	5.05	-0.051	0.919**	-							
4.Oral control	1.63	2.34	-0.082*	0.949**	0.720**	-						
5.Food preoccupation	1.35	2.28	-0.106**	0.900**	0.846**	0.728**	-					
6.Body image	1.90	3.12	-0.083*	0.858**	0.749**	0.638**	0.771**	-				
7.ORTO 11	26.78	5.63	0.182**	0.196**	0.201**	0.144**	0.143**	0.210**	-			
8.BSS	33.46	8.19	0.137**	-0.231**	-0.178**	-0.138**	-0.222**	-0.357**	-0.245**	-		
9.Overall body satisfaction	26.16	6.39	0.145**	-0.232**	-0.179**	-0.140**	-0.225**	-0.356**	-0.225**	0.989**	-	
10.Investment in body image	7.30	2.08	0.081*	-0.208**	-0.163**	-0.129**	-0.195**	-0.320**	-0.269**	0.894**	0.819**	-

Note. Results are based on Pearson correlation analyses. *p< 0.01, **p< 0.001. EAT-40 = Eating Attitudes Test. ORTO-11 = ORTO 11 Orthorexia Scale. BSS: Body Satisfacyion Scale.

Table 4. Hierarchical Regression Results for Eating Disorder (EAT-40)

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						0.010	0.010*
Constant	29.412***	25.396	33.429	2.047			
Age	-0.152**	-0.264	-0.040	0.057	-0.081**		
Sex (Female)	0.955	-1.307	3.218	1.153	0.023		
Educational level (High school and below)	3.988**	1.140	6.836	1.452	0.080**		
Employment status (No)	-2.608*	-4.931	-0.284	1.184	-0.065*		
Perceived income level (Income less than expenditure)	0.794	-1.764	3.352	1.304	0.017		
Step 2						0.028	0.018***
Constant	19.529***	11.465	27.593	4.111			
Age	-0.161**	-0.277	-0.046	0.059	-0.086**		
Sex (Female)	1.784	-0.548	4.116	1.189	0.044		
Educational level (High school and below)	3.804**	0.936	6.672	1.462	0.076**		
Employment status (No)	-3.303**	-5.649	-0.957	1.196	-0.082**		
Perceived income level (Income less than expenditure)	1.037	-1.512	3.586	1.299	0.022		
Chronic disease (Yes)	1.228	-2.181	4.636	1.738	0.020		

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Smoking (Yes)	1.751	-0.628	4.130	1.213	0.042		
Alcohol consumption (Yes)	-0.866	-3.203	1.472	1.192	-0.021		
Physical activity status (No)	-3.883**	-6.195	-1.572	1.178	-0.092**		
Sleep duration	1.356**	0.544	2.168	0.414	0.090**		
BMI	0.086	-0.059	0.230	0.074	0.033		
Step 3						0.049	0.021***
Constant	33.569***	24.106	43.032	4.824			
Age	-0.133*	-0.248	-0.019	0.058	-0.071*		
Sex (Female)	2.964*	0.618	5.311	1.196	0.073*		
Educational level (High school and below)	2.811	-0.050	5.672	1.458	0.056		
Employment status (No)	-3.375**	-5.697	-1.054	1.183	-0.084**		
Perceived income level (Income less than expenditure)	0.828	-1.696	3.351	1.286	0.017		
Chronic disease (Yes)	1.387	-1.987	4.761	1.720	0.022		
Smoking (Yes)	1.727	-0.628	4.081	1.200	0.041		
Alcohol consumption (Yes)	-0.178	-2.505	2.148	1.186	-0.004		
Physical activity status (No)	-4.509***	-6.807	-2.211	1.172	-0.107***		
Sleep duration	1.283**	0.479	2.087	0.410	0.085**		
BMI	0.073	-0.071	0.216	0.073	0.028		
Nutritional knowledge level	-0.174***	-0.237	-0.111	0.032	-0.151***		

Note. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit. *p<0.05. **p<0.01. ***p<0 .001.

Table 5. Hierarchical Regression Results for Eating Disorder (ORTO-11)

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						0.032	0.032***
Constant	28.217***	27.115	29.319	0.562			
Age	-0.035*	-0.066	-0.004	.016	-0.067*		
Sex (Female)	0.864**	0.244	1.485	0.316	0.076**		
Educational level (High school and below)	-1.523***	-2.305	-0.742	0.398	-0.110***		
Employment status (No)	-0.937**	-1.574	-0.299	0.325	-0.084**		
Perceived income level (Income less than expenditure)	0.656	-0.046	1.357	0.358	0.050		
Step 2						0.049	0.018***
Constant	30.388***	28.175	32.600	1.128			
Age	-0.035*	-0.067	-0.003	0.016	-0.067*		
Sex (Female)	0.989**	0.350	1.629	0.326	0.087**		

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Educational level (High school and below)	-1.325**	-2.112	-0.538	0.401	-0.096**		
Employment status (No)	-0.955	-1.598	-0.311	0.328	-0.085**		
Perceived income level (Income less than expenditure)	0.675	-0.024	1.375	0.356	0.051		
Chronic disease (Yes)	0.933	-0.002	1.868	0.477	0.054		
Smoking (Yes)	0.048	-0.604	0.701	0.333	0.004		
Alcohol consumption (Yes)	0.181	-0.460	0.822	0.327	0.016		
Physical activity status (No)	-1.182	-1.817	-0.548	0.323	-0.101		
Sleep duration	-0.193	-0.416	0.030	0.114	-0.046		
BMI	-0.012	-0.051	0.028	0.020	-0.016		
Step 3						0.064	0.015***
Constant	27.141***	24.537	29.745	1.328			
Age	-0.041*	-0.073	-0.010	0.016	-0.080*		
Sex (Female)	0.717*	0.071	1.362	0.329	0.063*		
Educational level (High school and below)	-1.095**	-1.883	-0.308	0.401	-0.079**		
Employment status (No)	-0.938**	-1.577	-0.299	0.326	-0.084**		
Perceived income level (Income less than expenditure)	0.724*	0.029	1.418	0.354	0.055*		
Chronic disease (Yes)	0.896	-0.033	1.824	0.473	0.051		
Smoking (Yes)	0.054	-0.594	0.702	0.330	0.005		
Alcohol consumption (Yes)	0.022	-0.618	0.662	0.326	0.002		
Physical activity status (No)	-1.038**	-1.670	-0.405	0.322	-0.088**		
Sleep duration	-0.176	-0.397	0.045	0.113	-0.042		
BMI	-0.008	-0.048	0.031	0.020	-0.012		
Nutritional knowledge level	0.040***	0.023	0.058	0.009	0.126***		

Note. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit. *p<0.05. **p<0.01. ***p<0 .001.

Table 6. Hierarchical Regression Results for body satisfaction

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						0.027	0.027***
Constant	32.042***	30.383	33.700	0.845			
Age	0.067*	0.014	0.120	0.027	0.090*		
Sex (Female)	-0.555	-1.458	0.349	0.460	-0.034		
Marital status (Married)	0.622	-0.574	1.818	0.610	0.037		
Educational level (High school and below)	-0.566	-1.731	0.599	0.594	-0.028		
Employment status (No)	0.072	-0.876	1.020	0.483	0.004		

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Perceived income level (Income less than expenditure)	-1.981***	-3.000	-0.962	0.520	-0.105***		
Step 2						0.058	0.031***
Constant	35.161***	31.957	38.365	1.633			
Age	0.097***	0.043	0.150	.027	0.130***		
Sex (Female)	-0.894	-1.818	0.029	0.471	-0.055		
Marital status (Married)	0.738	-0.452	1.928	0.606	0.044		
Educational level (High school and below)	-0.232	-1.394	0.930	0.592	-0.012		
Employment status (No)	0.073	-0.876	1.021	0.483	0.005		
Perceived income level (Income less than expenditure)	-1.896***	-2.904	-0.887	0.514	-0.100***		
Chronic disease (Yes)	-1.919**	-3.276	-0.562	0.692	-0.077**		
Smoking (Yes)	-0.597	-1.540	0.346	0.481	-0.036		
Alcohol consumption (Yes)	-0.018	-0.949	0.913	0.475	-0.001		
Physical activity status (No)	-0.688	-1.609	0.232	0.469	-0.041		
Sleep duration	0.092	-0.229	0.412	0.163	0.015		
BMI	-0.153***	-0.210	-0.096	0.029	-0.150***		
Step 3						0.075	0.017***
Constant	30.117**	26.360	33.874	1.915			
Age	0.085**	0.032	0.139	0.027	0.115**		
Sex (Female)	-1.322**	-2.254	-0.391	0.475	-0.082**		
Marital status (Married)	0.774	-0.406	1.953	0.601	0.047		
Educational level (High school and below)	0.132	-1.029	1.293	0.592	0.007		
Employment status (No)	0.095	-0.845	1.035	0.479	0.006		
Perceived income level (Income less than expenditure)	-1.819***	-2.819	-0.819	0.510	-0.096***		
Chronic disease (Yes)	-1.997**	-3.343	-0.652	0.686	-0.080**		
Smoking (Yes)	-0.595	-1.530	0.340	0.476	-0.036		
Alcohol consumption (Yes)	-0.268	-1.196	0.660	0.473	-0.016		
Physical activity status (No)	-0.490	-1.405	0.426	0.467	-0.029		
Sleep duration	0.120	-0.198	0.438	0.162	0.020		
BMI	-0.149***	-0.205	-0.092	0.029	-0.146***		
Nutritional knowledge level	0.053***	0.033	0.084	0.013	0.133***		

Note. CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit. *p<0.05. **p<0.01. ***p<0 .001.

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Discussion

This study provides new evidence on the complex role of nutritional knowledge in shaping eating behaviors and body-related outcomes among Turkish adults. The results confirmed that greater nutritional knowledge was associated with fewer disordered eating symptoms, thereby highlighting its protective function. At the same time, higher nutritional knowledge was positively related to both orthorexic tendencies and body satisfaction, emphasizing the paradoxical effects of knowledge as both a health-promoting and risk-enhancing factor. By including a broad range of demographic and lifestyle covariates, the present study expands existing literature and demonstrates that nutritional knowledge exerts independent associations even when influential factors such as BMI, sex, and education are considered.

Demographic factors, particularly sex, education and BMI, further clarify these relationships. It was reported that women consistently experience lower body satisfaction and a higher risk for disordered eating compared to men, largely driven by sociocultural appearance ideals [38,39]. Importantly, in our models, nutritional knowledge effects persisted after controlling for sex, indicating that the paradoxical influence of knowledge transcends sex-based differences, although these dynamics may be more pronounced in women. Education is another critical factor: higher educational attainment is typically associated with increased nutrition knowledge and healthier practices [6,40]. Yet, our results demonstrate that even after adjusting for education, nutritional knowledge retained its associations with eating behaviors and body satisfaction. This implies that the manner in which knowledge is interpreted and applied, whether flexibly or rigidly, may matter more than the mere level of formal education.

BMI has long been linked to lower body satisfaction and greater vulnerability to disordered eating, with higher BMI individuals often reporting more weight-related concerns [41,42]. In our analysis, nutritional knowledge maintained significant associations with eating attitudes and body satisfaction even after adjusting for BMI, suggesting an independent effect.

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However, it is plausible that among individuals with elevated BMI, knowledge may interact with body dissatisfaction to reinforce stricter or more rigid dietary practices, potentially increasing orthorexic tendencies [43].

These results align with prior research emphasizing both the protective and paradoxical roles of nutritional knowledge. Several studies have demonstrated that higher nutrition knowledge is associated with healthier dietary choices and reduced risk of disordered eating symptoms [44,45]. At the same time, other studies have highlighted that excessive or narrowly applied knowledge can foster perfectionistic and rigid eating patterns consistent with orthorexic tendencies [18,47,48]. The present study extends this evidence by showing that these associations persist even when demographic covariates such as BMI, sex, and education are accounted for, suggesting that nutritional knowledge itself, rather than these demographic characteristics, remains a central predictor. Furthermore, consistent with evidence linking higher nutritional knowledge to greater perceived competence and body appreciation [49,50], our results demonstrated a positive association between knowledge and body satisfaction. Nevertheless, this relationship may not be universally beneficial: when knowledge acquisition occurs in environments characterized by appearance-ideal internalization and high social comparison, particularly among women and individuals with elevated BMI, it may paradoxically heighten body dissatisfaction and maladaptive eating attitudes [21,51].

From a public health perspective, these results highlight the importance of designing nutrition education initiatives that go beyond factual knowledge transfer. While increasing knowledge can reduce the risk of disordered eating, it may also unintentionally promote rigid or perfectionistic dietary patterns, especially in individuals with higher BMI, women vulnerable to sociocultural body ideals, and those with advanced education who may over-apply detailed nutrition information. Interventions should therefore integrate psychological safeguards, including the promotion of intuitive eating, body functionality appreciation, and self-

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compassion, to mitigate the risk of knowledge fueling orthorexic tendencies [45,50,52]. Furthermore, embedding media literacy training within nutrition education can help individuals critically evaluate sociocultural appearance pressures and avoid harmful comparisons amplified by social media [46]. Programs tailored to high-risk groups such as women, those with elevated BMI, and individuals demonstrating high academic achievement, may be particularly effective, as these groups appear most susceptible to transforming nutritional knowledge into rigid control rather than flexible, health-promoting behaviors.

Taken together, these interrelations suggest a dual pathway: nutrition knowledge relates to lower global eating-disorder risk yet can coincide with orthorexic rigidity when knowledge is enacted perfectionistically, whereas higher body satisfaction appears to buffer disordered-eating risk and counterbalance rigidity. These patterns are consistent with recent evidence linking perfectionism to orthorexia and showing that "knowing more" does not invariably translate into flexible, health-focused eating, while positive body image prospectively predicts lower orthorexia [27, 53, 54].

Mechanisms & future directions

A plausible explanatory model is that knowledge confers self-efficacy and health-focused decision-making (reducing EAT-40 risk) while sociocultural appearance pressures and perfectionistic standards (amplified by digital media) shape whether that knowledge is used flexibly (beneficial) or rigidly (orthorexic). Body satisfaction may operate as a resilience factor in this system, whereas low satisfaction could tilt individuals toward over-control. Given the cross-sectional design, we refrained from formal mediation testing; however, future longitudinal studies could evaluate (a) *body satisfaction as a mediator* of the knowledge → EAT-40 link and (b) *appearance-ideal internalization/perfectionism as moderators* of the knowledge → orthorexia link. Interventions should therefore couple knowledge building with psychological safeguards (e.g., intuitive/mindful eating, self-compassion, media-literacy),

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explicitly targeting rigidity and appearance-based contingencies to preserve the benefits of knowledge while minimizing orthorexic drift.

Strengths and Limitations

One of the strengths of this study is its large sample size. The inclusion of 1457 adults across Turkey increases the generalizability of the results. Additionally, the use of multivariate analyses (e.g., correlation and regression analyses) to understand the relationships between nutrition knowledge, eating disorders, and body satisfaction broadens the scope of the results. Another important strength is the use of validated and reliable scales, which increases the reliability of the data.

However, this study also has several limitations. Owing to its cross-sectional design, causal relationships between nutrition knowledge, eating behaviors, and body satisfaction could not be assessed. This limitation prevents definitive conclusions regarding the direction of the observed associations. Moreover, the reliance on self-reported data introduces potential issues such as information bias and recall bias. Specifically, self-reported anthropometric measurements, such as height and weight, may limit the accuracy of the results. Furthermore, the study was conducted via an online survey, which may introduce selection bias and limit the generalizability of the results to the broader population. Another limitation relates to the use of ORTO-11 for assessing orthorexic tendencies. Although widely applied, this instrument has been criticized for outdated conceptualization and weak psychometric properties, and newer tools (e.g., Teruel Orthorexia Scale, Düsseldorf Orthorexia Scale) are increasingly recommended. Consequently, the associations reported here should be interpreted in light of these measurement constraints.

Despite these limitations, this study contributes to a more nuanced understanding of the dual role of nutritional knowledge, highlighting its potential to act as both a protective and a risk factor. Building on these results, future research should adopt longitudinal designs to clarify causal pathways, integrate updated and psychometrically stronger instruments for orthorexia assessment, and expand analyses to include diverse cultural and socioeconomic contexts.

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Additionally, intervention studies that combine nutrition education with psychological components such as body image resilience, intuitive eating, and media literacy, hold promise for mitigating the risks while amplifying the protective benefits of nutritional knowledge.

Conclusion

This study highlights the complex relationships among nutritional knowledge, eating disorders, and body satisfaction among Turkish adults. These results reveal that while greater nutritional knowledge is associated with a reduced risk of eating disorders, it paradoxically correlates with increased orthorexic tendencies and body satisfaction. These results underscore the dual-edged nature of nutritional knowledge: it can serve as a protective factor against disordered eating but may also foster unhealthy obsessions with food and appearance. Given these results, public health initiatives and nutrition education programs must adopt a balanced approach. Educational strategies should not only aim to increase nutritional knowledge but also address the psychological and behavioral risks associated with excessive focus on healthy eating and body image. The incorporation of mental health support and fostering of positive body acceptance in these programs can mitigate potential adverse effects. Future research should employ longitudinal designs to better understand the causal pathways between nutritional knowledge, eating behaviors, and body satisfaction. Expanding studies to include diverse cultural and socioeconomic contexts will provide a more comprehensive understanding of these relationships. Multidisciplinary interventions that integrate nutrition, psychology, and public health principles are vital for promoting holistic well-being.

In conclusion, while improving nutritional knowledge is critical for fostering healthy eating behaviors, a nuanced approach is necessary to ensure that it translates into positive and sustainable lifestyle changes.

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Data availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Informed Consent

Informed consent was obtained from all participants included in this study.

Competing Interests

The authors declare that there are no commercial or financial conflicts of interest related to this study.

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