Relationship between nutritional literacy and quality of life in Turkish adults: a cross-sectional survey

ABSTRACT

Background and Objectives: Nutrition literacy is a modifiable lifestyle risk factor, and addressing literacy-related barriers may help improve health outcomes, including quality of life. This cross-sectional and descriptive study examines the relationship between Turkish adult's nutrition literacy and quality of life.

Materials and Methods: We conducted online surveys with volunteers aged 18-65 with a minimum primary school education who provided consent. We used the evaluation Instrument of Nutrition Literacy (EINLA) scale to evaluate the nutritional literacy level of the participants and the 36-item short-form health survey questionnaire (SF-36) to evaluate the quality of life. SPSS v25.0 (IBM Corp., NY, USA) was used for the statistical analysis of the data.

Results: Participants (n=1379) had a mean age of 33.89 (sd: 13.11) years; 1001 (73%) were female, 776 (55%)were single, 822 (59.6%) were college graduates, 366 (26.5%)were overweight, 164 (11.9%) obese, and 177(12.8%)lived alone. There was a statistically significant correlation between the total nutrition literacy scores of the participants and their general health (r=0.220), physical function (r=0.351), physical role difficulty (r=0.088), function (r=0.253), pain (r=0.154) and mental health (r=0.213) (p<0.001). Except for the emotional role difficulty (p=0.128) and vitality (p=0.191) sub-dimensions of SF-36, there was a statistically significant correlation between the nutrition literacy level of the participants and their quality-of-life p<0.05 and p<0.001.

Conclusion: Based on these results, as participants' nutritional literacy level increases, their quality of life improves. Therefore, this study confirms that improving nutrition literacy may positively affect the quality of life. Further research, however, needs to be undertaken to substantiate this conclusion with heterogeneous samples.

Paper Type: Research Article

Keywords: Nutrition literacy, Quality of Life, Survey Questionnaire, Health Literacy, Nutrition Education.

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Introduction

Healthy nutrition is a public health approach, the World Health Organization (WHO) published a global plan to eliminate chronic diseases due to poor nutrition by 2025. This plan aims to convey the importance of physical activity and nutrition to the public and raise awareness by promoting the effective use of health literacy as a tool for prevention (1). A literature review by Krause et al. identifies nutrition and food literacy as unique but complementary concepts under the broader realm of health literacy. The evidence suggests that nutrition literacy predicts adherence to healthy dietary patterns and may be associated with healthier food consumption. Therefore, it is critical to assess and improve the nutrition literacy level of the public to adopt healthy eating behaviors and habits, mitigate nutritional problems, and prevent nutrition-related diseases (2).

Nutrition literacy (NL) is how people obtain, process, and understand basic nutrition information (3), further categorized as functional, interactive, and critical nutrition literacy. Functional nutrition literacy (FNL) is an individual's ability to understand the different nutrition categories and interpret nutrition-related messages. Interactive nutrition literacy (INL) encompasses cognitive skills to cope with nutritional issues while interacting with healthcare professionals. Similarly, critical nutrition literacy (CNL) is an individual's capacity to evaluate nutrition information critically by understanding perceived barriers and transforming it to raise awareness among peers and their social network (4).

The role of nutrition literacy and the number of research studies conducted in this field are rising in Turkey and worldwide (5-7). For example, a study conducted in Turkey in 2018 concluded that only one-third of the participants possessed adequate nutrition literacy. Furthermore, the authors found a positive correlation between education level and nutrition literacy, while there was no statistically significant correlation between nutritional habits and nutrition literacy (6). In contrast, several studies reported high nutrition literacy levels. For example, a study by Özenoğlu et al. (5), reported high nutrition literacy among underweight and ideal body weight individuals. Hence, nutrition literacy positively impacts body mass index (BMI) and healthy eating behaviors. Overall, nutrition literacy skills are potent tools for attaining healthy nutrition goals.

Nutrition literacy positively affects BMI, leads to better management of therapeutic diets, and helps maintain healthy eating goals, affecting a person's quality of life. Food’s direct relationship to lifestyle and cultural factors, therefore, makes it a significant contributor to quality of life (8)

Our study aims to investigate the relationship between nutrition literacy and quality of life.

Previous studies had limited scope and smaller sample sizes and covered fewer geographical regions. Besides this our study aim while assessing participants' literacy levels with a large sample covering a broader territory in Turkey using a standardized geographical classification. We hypothesize that nutrition literacy will increase the quality of life.

Materıals and Method

This cross-sectional and descriptive study evaluates the relationship between nutrition literacy and quality of life. Between February and June 2022, online surveys (https://docs.google.com/forms/d/e/1FAIpQLScpkABBdtUGPCS7Ohtko193uQnihm6tj-Sn8q0uU4fsez9DZg/viewform) were conducted with volunteers aged 18-65 who had received minimal primary school education and gave their consent. The study coordinators sent a link to the online survey questionnaire using the snowball sampling method via social media tools, instant messaging apps, or SMS. Participants signed an informed consent electronically prior to participation. Participants then shared the online survey questionnaire using the same instructions.

The study used the method Cohen (9) developed (d = 0.158 (intermediate level)), to measure effect size ($p<0.01$). However, to achieve a more extensive sampling size based on the correlation guidelines for Cohen, the correlation between two continuous variables was tested with d=0.10, 95% confidence level (1-α), 95% test power (1-β) using the G- power (v 3.1) which predicted 1289 participants as the sample. Acıbadem Mehmet Ali Aydınlar University and Acıbadem Healthcare Institutions Medical Ethics Committee (ATADEK) approved the study on January 28, 2022, with IRB protocol number 2022-02/20.

The data collected consists of demographics (age, gender, marital, education, and income status), anthropometric (body weight, height, body mass index(BMI)) and health status information, the EINLA, and the quality-of-life SF-36 questionnaire (10, 11, 12) .The authors used the EINLA, which has been validated and reliable in Turkish, to assess the nutrition literacy of participants (11). The Turkish validity and reliability of EINLA, which consists of a total of 35 questions, including five subdomains, was assessed by Cesur et al. in 2015 with a Cronbach Alpha reliability coefficient of 0.75. (11). The first section of the scale includes ten questions about general nutritional knowledge. The second section covers six questions about reading comprehension-interpretation, the third includes ten questions about food groups, and the fourth part has three questions about portion size. The last part includes six questions about reading the nutritional label and essential numerical ability.

Furthermore, the Turkish validity and reliability of the self-reported SF-36 Quality of Life Questionnaire were performed by Koçyiğit et al. in 1999, with Cronbach's alpha coefficients surpassing the 0.70 criteria for all subscales indicating good internal consistency (12). Lastly, the researchers followed the NUTS classification (Nomenclature of territorial units for statistics) to reach 1379 participants. NUTS is a geographical standard within the European Union that references the subregions in each country. As a candidate country, Turkey's NUTS classifications are officially termed statistical regions, and its three NUTS levels are: NUTS-1: 12 Regions; NUTS-2: 26 Subregions; NUTS-3: 81 Provinces (13)

Statistical Evaluation of Data

SPSS v 25.0 (IBM Corp., NY, USA) was used for the statistical analysis of the data. The non-parametric Kolmogorov-Smirnov was used to

test the normality of the scores obtained from a continuous variable. In addition to descriptive methods (number, percentage, mean, median, and standard deviation), one-way ANOVA and post hoc Scheffe test helped determine from which groups the difference originated. Pearson weighted test evaluated the correlation between two continuous variables. Each measurement's Cronbach alpha reliability coefficient helped assess reliability. Univariate and multivariate linear regression scales measured the independent variables' impact on the dependent variables. As a multivariate regression measure, the variance inflation factor for the independent variables (VIF) tested the correlation among independent variables in the least squares regression models. VIF values were less than 10. In addition, the Durbin-Watson test values ranged between 1.2 and 1.9 for the three scales applied. Finally, the 95% confidence interval was evaluated with $p<0.05$.

Results

Characteristics of the participants

A total of 1751 volunteers participated in the study, and 1379 were included in the final analysis. Participants were excluded for not meeting the inclusion criteria; 29 were less than 18 years old, 44 were over 65 years old, five had no formal training, and 294 had missing data. Of the 1379 participants in the final analysis, the mean age was 33.89 (sd:13.11) years, 1001(72.6%) female, 756 (54.8%) single, 822 (59.6%) college graduates, 366 (26,5%) overweight,164 (11.9%) obese, 177 (12.8%) lived alone, 1284 (93%) reported excellent and medium income, 559 (40.5%) requested a nutritionist/dietician consult and 604 (34%) had an existing medical diagnosis (Table1).

According to the NUTS classification, the geographical distribution of the participants is: Istanbul 54.53% (n=752), West Marmara 4.35% (n=60), Aegean 10.65% (n=147), East Marmara 6.30% (n=87), Western Anatolia 6.17% (n=85), Mediterranean 6.60% (n=91), Central Anatolia 1.52% (n=21), Eastern Black Sea 1.23% (n=17), Northeastern Anatolia 0.22% (n=3), Central Anatolia is 0.44% (n=6), and Southeast Anatolia is 4.64% (n=64).

Distribution of sub-categories with the nutrition literacy level

The average total nutrition literacy score was 27.80± 4.30. Overall, the nutrition literacy level of 88% of the participants is sufficient. The EINLA sub-scale illustrates that general nutrition knowledge of 81.4%, reading comprehension and interpretation of 75%, food groups knowledge of 88%, portion size knowledge of 14%, reading food labels, and basic mathematics knowledge of 50.9% of participants are deemed sufficient. The internal consistency scale of Cronbach is 0.60 at an acceptable level.

SF-36 quality of life scale scores

The sub-section scores were the following: general health indicators 47.17±13.21, physical function 82.34±19.86, physical role difficulty 71.56±34.99, emotional role difficulty 65.29± 35.09, social function 65.26±26.25, pain 73.09±23.97, mental health 60.90±18.03, vitality 53.18± 18.18. In addition, the physical component score (PCS) and mental component scores (MCS) were calculated as 68.54±16.62 and 61.31± 18.1, respectively. Therefore, a Cronbach alpha scale of 0.78 for internal validity is highly reliable.

Table 1: Demographic characteristics of the participants

Variables(N=1379)	Category	n(%)	Mean±SD
Age	All	1379(100)	33.89±13.11
Age group	<25	518(37.6)	
	25-34	291(21.1)	
	35-44	204(14.8)	
	45-65	366(26.5)	
Gender	Women	1001(72.6)	
	Men	378(27.4)	
Marital status	Married	623(45.2)	
	Single	756(54.8)	
BMI	All	1379(100)	24.41±4.72
BMI group	Underweight	76(5.5)	
	Normal	773(56.1)	
	Overweight	366(26.5)	
	Obese	164(11.9)	
Education Level	Primary	59(4.3)	
	Lower secondary	498(36.1)	
	Upper secondary	822(59.6)	
Work Status	Yes	661(47.9)	
	No	718(52.1)	
Living situation	Alone	177(12.8)	
	With family	1074(77.9)	
	Friend	128(9.3)	
Income	High	400(29)	
	Moderate	884(64.1)	
	Low	95(6.9)	
Medical diagnosis	Yes	466(33.8)	
	No	913(66.2)	
Comorbidities	Cardiovascular disease	53(3.8)	
	Diabetes	65(4.7)	
	Hypertension	72(5.2)	
	Cancer	42(3)	
	Gastrointestinal diseases	54(3.9)	
	Respiratory system diseases	36(2.6)	
	Psychological issues	35(2.5)	
	Musculoskeletal system diseases	41(3)	
	Endocrine diseases	91(6.6)	
	Vitamin and mineral insufficiency	115(8.3)	
Assessing nutrition literacy	Sufficient	563(40.8)	
	Borderline	639(46.3)	
	Insufficient	177(12.8)	
Nutrition knowledge source	Doctor, nurse	293(21.2)	
	Dietitian	559(40.5)	
	Family	106(7.7)	
	Friends	134(9.7)	
	Textbooks	156(11.3)	
	Newspapers or periodicals	148(10.7)	
	İnternet	387(28.1)	
	Television - radio	152(11)	

The relationship between nutrition literacy and quality of life

Except for the emotional role difficulty (p=0.128) and vitality (p=0.191) sub-dimensions of SF-36, there is a statistically significant correlation between the nutrition literacy level of the participants and their quality-of-life p<0.05 and p<0.001. The subgroup analysis determined that this difference was between all subgroups in the physical function category while in the other subgroups it was within the nutrition literacy, the borderline and insufficient literacy groups. Data on adequate, borderline, and insufficient literacy dimensions showed mean PCS scores of 69.64±15.65, 61.16±20.90, and 48.75±18.82, respectively. In addition, mean MCS scores were 62.30±18.12, 54.37±16.74, and 47.02±14.37, respectively (p<0.001). These findings illustrate that PCS and MCS scores are higher amongst participants with sufficient nutrition literacy levels (Table2).

Table 2: Participants' quality of life scale (SF-36) scores based on nutritional literacy level

Sf-36	Nutrition Literacy Level			F	p-value	Diff**.
	Sufficient (n=1218)	Borderline (n=149)	Insufficient c (n=12)			
GH	47.90±12.59	41.85±16.42	39.17±12.94	16.555	<0.001*	a>b,c
PF	84.14±18.00	70.13±26.81	51.25±21.86	51.348	<0.001*	a>b>c
RP	72.25±34.68	67.45±36.96	52.08±36.08	3.133	0.044*	NA
RE	65.76±34.77	62.86±36.87	47.22±41.34	2.062	0.128	NA
SF	67.11±25.85	52.10±25.23	40.63±21.40	28.098	<0.001*	a>b,c
BP	74.26±22.67	65.22±30.59	52.50±32.53	14.178	<0.001*	a>b,c
MH	62.21±17.90	51.17±16.38	49.00±7.46	28.622	<0.001*	a>b,c
VT	54.11±18.54	51.34±15.46	51.25±5.28	1.658	0.191	NA
PCS	69.64±15.65	61.16±20.90	48.75±18.82	26.802	<0.001*	a>b>c
MCS	62.30±18.12	54.37±16.74	47.02±14.37	16.794	<0.001*	a>b,c

*p<0.05, F=One-Way ANOVA analysis, NA= not available, **= Scheffe test

GH: General Health, PF: Physical Function, PR: Role Physical, RE: Role Emotional, SF: Social Function, BP: Bodily Pain, MH: Mental Health, VT: Vitality, PCS: Physical Component Score, MCS: Mental Component Scores

There is a statistically significant correlation between the total nutrition literacy status of the participants and general health (r=0.220), physical function (r=0.351), physical role difficulty (r=0.088), function (r=0.253), pain (r=0.154) and mental health (r) =0.213) (p<0.001). This finding support that as the nutrition literacy level of participants increases, so does their quality of life.

Factors related to Physical Component Scores (PCS)

The univariate analysis shows that age, gender, marital status, education level, BMI, lifestyle, income, comorbidities, and nutritional literacy correlate statistically with the PCS scores (p<0.05 and p<0.001). As age (B=-0.12, p<0.001) and BMI (B=-0.80; p<0.001) increased, the participants' PCS scores declined. In contrast, the education (B=3.61; p<0.001), income (B=1.96; p=0.015), and nutrition literacy (B=0.97; p<0.001) levels correlated with increased PCS scores. In addition, male gender (B=3.44; p=0.001), single status (B=3.02; p=0.001), living alone (B=5.60; p<0.001), and absence of comorbidities (B=8.18; p=0.001) <0.001)

correlated with increases in PCS scores (Table 3).

To analyze PCS and its independent variables, we used multiple regression analysis with r2=0.18. Since the p-value is less than α (p<0.001), the model is statistically significant within a 95% confidence level. The independent variables were: gender [B=5.3(95%CI:3.4;7.2), t=5.4, p<0.001], BMI [B=-0.77 (95% CI:- 0.97;-0.57)), t=-7.7, p<0.001], lifestyle [B=3.7 (95%CI:1.2;6.3), t=2.8, p=0.005], presence of comorbidity [B=6.1(95%CI:4.3);7.9),t=6.7,p<0.001] and nutrition literacy level [B=0.91(95%CI:0.71;1.1), t=9.2, p<0.001].

Based on these results, we concluded that males, compared to females, those living alone vs. living with family or someone else, and those without comorbidities vs. with comorbidities had better PCS scores. In summary, BMI correlated inversely with PCS, whereas nutrition literacy correlated positively with PCS. In addition, the partial correlations square analysis results illustrated that the variable with the highest level of correlation with PCS was nutrition literacy level (pr2 =0.24) (Table 3).

Factors related to Mental Component Scores (MCS)

There is a statistically significant correlation between MCS scores, comorbidities, and nutritional literacy levels (p<0.05 and p <0.001). As age (B=0.18, p<0.001), education (B=4.48; p<0.001), income (B=5.66; p<0.001), and nutrition literacy (B=0.74; p<0.001) levels increased, as a result, the participants' MCS scores increased. In addition, male gender (B=2.24; p=0.041), living alone (B=4.31; p=0.003), and absence of comorbidities (B=5.94; p<0.001) had a positive correlation with MCS, whereas being single (B=-3.08; p=0.002) and unemployed (B=-3.14; p=0.001) were negatively correlated with MCS.

Multivariate regression analysis results

To determine MCS quality of life and its independent variables, we used multiple regression analysis with r2 =0.17. The level of correlation between the model's independent variables and dependent variables varies; age [B=0.21(95%CI:0.12;0.31), t=4.3, p<0.001], gender [B=2.8(95%CI:0.7;4.8), t=2.6, p=0.010], education [B=2.02 (95%CI: 0.2;3.8), t=2.2, p=0.029], lifestyle [B=3.9(95%CI:1.1;6.8), t=2.7, p=0.008], income [B=4.5(95%CI:2.9;6.2), t=5.4, p<0.00], comorbidity [B=7.3 (95%CI:5.3;9.3), t=7.1, p<0.001] and nutrition health literacy [B=0.67(95%CI:0.46;0.89), t=6.1, p<0.001]. Based on these results, we concluded that males, compared to females, those living alone vs. living with family or someone else, and those without comorbidities vs. with comorbidities had better MCS scores. Age, education, income, and nutritional health literacy positively correlated with MCS scores. The variables with the highest correlation with MCS were comorbidities and nutrition literacy level (pr2=0.19 and 0.16) (Table3).

The education (B=1.49; p<0.001) and income levels (B=0.51; p=0.014), and consultation with a dietician (B=2.01; p<0.001) had a positive correlation with nutrition literacy, whereas BMI (B=-0.08; p=0.001) and being male (B=-1.36; p<0.001) had a negative correlation (Table 4).

Table 3: Univariate and Multiple Linear Regression Model for factors associated with quality of life (PCS and MCS)

Variables	Univariate Linear Regression Model						Multiple Linear Regression Model						pr2	VIF	Model summary
	Unstandardized Coefficients		95% CI for B		t	p-value	Unstandardized Coefficients		95% CI for B		t	p-value			
	B	SE.	LLCI	ULCI			B	SE.	LLCI	ULCI					
(Constant) (PCS)							35.43	5.94	23.79	47.08	5,97	<0.001*			R2=0.177
Age	-0.12	0.03	-0.19	-0.05	-3.54	<0.001*	0.08	0.05	-0.01	0.16	1,66	0.097	0.05	2.12	F(10-1368)=29.349
Gender (0=Women,1=Men)	3.44	1.00	1.48	5.40	3.44	0.001*	5.29	0.98	3.38	7.21	5,43	<0.001*	0.15	1.14	p<0.001
Marital status (0=Women, 1=Men)	3.02	0.90	1.27	4.78	3.37	0.001*	0.39	1.19	-1.94	2.72	0,33	0.741	0.01	2.10	DW=1.169
Education Level	3.61	0.77	2.10	5.12	4.69	<0.001*	1.57	0.82	-0.04	3.18	1,91	0.056	0.05	1.35	Method=Enter
BMI	-0.80	0.09	-0.98	-0.62	-8.63	<0.001*	-0.77	0.10	-0.97	-0.57	-7,71	<0.001*	-0.20	1.34	Dependent Variable=PCS
Work Status (0=Yes,1=No)	-1.72	0.90	-3.47	0.04	-1.92	0.055	-0.71	0.97	-2.61	1.18	-0,74	0.462	-0.02	1.40	
Living situation (0=other, 1=alone)	5.60	1.33	2.99	8.21	4.21	<0.001*	3.71	1.31	1.15	6.28	2,84	0.005*	0.08	1.15	
Income	1.96	0.80	0.39	3.54	2.45	0.015*	1.37	0.74	-0.09	2.82	1,85	0.065	0.05	1.02	
Medical diagnosis (0=Yes, 1=No)	8.18	0.92	6.37	9.98	8.88	<0.001*	6.14	0.92	4.34	7.94	6,69	<0.001*	0.18	1.13	
Nutrition Literacy	0.97	0.10	0.77	1.17	9.59	<0.001*	0.91	0.10	0.71	1.10	9,18	<0.001*	0.24	1.08	
Variables	B	SE.	LLCI	ULCI	t	p-value	B	SE.	LLCI	ULCI	t	p-value	pr2	VIF	Model Summary
(Constant) (MCS)							8.14	6.23	-4.09	20.36	1.31	0.192			R2=0.116
Age	0.18	0.04	0.10	0.25	4.76	<0.001*	0.21	0.05	0.12	0.31	4.34	<0.001*	0.12	1.92	F(9-1369)=21.060
Gender (0=Women,1=Men)	2.24	1.09	0.09	4.39	2.05	0.041*	2.75	1.06	0.66	4.83	2.59	0.010*	0.07	1.06	p<0.001
Marital status (0=Women, 1=Men)	-3.08	0.98	-5.00	-1.16	-3.15	0.002*	-1.16	1.34	-3.78	1.46	-0.87	0.385	-0.02	2.10	DW=1.659
Education Level	4.48	0.84	2.83	6.12	5.34	<0.001*	2.02	0.93	0.20	3.84	2.18	0.029*	0.06	1.35	Method=Enter
BMI	-0.17	0.10	-0.37	0.04	-1.59	0.112	NA	NA	NA	NA	NA	NA	NA	NA	Dependent Variable=MCS
Work Status (0=Yes,1=No)	-3.14	0.98	-5.05	-1.23	-3.22	0.001*	0.18	1.09	-1.96	2.31	0.16	0.873	0.00	1.40	
Living situation (0=other, 1=alone)	4.31	1.46	1.45	7.17	2.96	0.003*	3.95	1.47	1.05	6.84	2.68	0.008*	0.07	1.15	
Income	5.66	0.87	3.96	7.36	6.55	<0.001*	4.52	0.84	2.88	6.16	5.41	<0.001*	0.15	1.02	
Medical diagnosis (0=Yes, 1=No)	5.94	1.02	3.94	7.94	5.82	<0.001*	7.30	1.03	5.29	9.31	7.12	<0.001*	0.19	1.11	
Nutrition Literacy	0.74	0.11	0.52	0.96	6.57	<0.001*	0.67	0.11	0.46	0.89	6.07	<0.001*	0.16	1.08	

***p<0.05, LLCI**=Lower limit confidence interval, **ULCI**=Upper limit confidence interval, **SE**=Standard error, **DW**=Durbin Watson statistic, pr^2= Partial Correlations Square, **VIF**= Variance inflation factor, **NA**= not available **PCS:** Physical Component Score, **MCS:** Mental Component Scores

Table4: Univariate and Multiple Linear Regression Model for factors associated with nutritional literacy

Variables	Univariate Linear Regression Model						Multiple Linear Regression Model						pr2	VIF	Model summary
	Unstandardized Coefficients		95% CI for B		t	p-value	Unstandardized Coefficients		95% CI for B		t	p-value			
	B	SE.	LLCI	ULCI			B	SE.	LLCI	ULCI					
(Constant)							25.05	0.93	23.23	26.86	27.05	<0.001*			R2=0.106
Age	-0.01	0.01	-0.02	0.01	-0.60	0.548	NA	NA	NA	NA	NA	NA	NA	NA	F(5-1378)=32.599
Gender (0=Women,1=Men)	-1.36	0.26	-1.87	-0.86	-5.30	<0.001*	-0.90	0.25	-1.39	-0.40	-3.54	<0.001*	-0.10	1.06	p<0.001
Marital status (0=Women,1=Men)	-0.18	0.23	-0.64	0.27	-0.79	0.432	NA	NA	NA	NA	NA	NA	NA	NA	DW=1.888
Education Level	1.49	0.20	1.10	1.87	7.56	<0.001*	1.33	0.19	0.95	1.70	6.93	<0.001*	0.18	1.02	Method=Enter
BMİ	-0.08	0.02	-0.13	-0.03	-3.27	0.001*	-0.08	0.02	-0.13	-0.03	-3.29	0.001*	-0.09	1.05	Dependent Variable: Nutritional Literacy
Work Status (0=Yes,1=No)	-0.22	0.23	-0.68	0.23	-0.95	0.341	NA	NA	NA	NA	NA	NA	NA	NA	
Living situation (0=other, 1=alone)	0.34	0.35	-0.34	1.01	0.97	0.332	NA	NA	NA	NA	NA	NA	NA	NA	
Income	0.51	0.21	0.10	0.92	2.46	0.014*	0.30	0.20	-0.09	0.69	1.52	0.128	0.04	1.01	
Medical diagnosis (0=Yes, 1=No)	0.11	0.25	-0.37	0.59	0.46	0.648	NA	NA	NA	NA	NA	NA	NA	NA	
Consultation with a dietician (0=No, 1=Yes)	2.01	0.23	1.56	2.46	8.76	<0.001*	1.80	0.23	1.35	2.24	7.91	<0.001*	0.21	1.04	

Multiple regression analysis with R2 =0.11 explores nutrition literacy and gender status [B=-0.90(95% CI:- 1.4;-0.4), t=-3.5, p<0.001], education level [B=1.3(95%CI:0.95; 1.7)), t=6.9, p<0.001], BMI [B=-0.1(95%CI:-0.13;-0.03), t=-3.3, p=0.001] and nutritional consultation with a dietician [B=1.8(95%) CI: 1.4; 2.2), t=7.9, p<0.00]. We concluded that nutrition literacy was higher in females and those who consulted a dietician. Furthermore, participants' nutrition literacy had a positive correlation with education level and had an inverse correlation with BMI. The variable with the highest correlation with nutritional literacy level was consultation with a dietician (pr 2 = 0.21) (Table 4).

Discussion

As far as we know, our study is unique among the studies examining the relationship between nutrition literacy and quality of life in Turkey using the NUTS classification and with the largest sample characteristics. We found that 88% of the participants had adequate levels of nutritional literacy, and the average nutrition literacy score was 27.80±4.30. These findings are consistent with those of previous studies conducted in Turkey (5, 11). We also found a statistically significant positive correlation between the core math subareas of nutrition label reading and EINLA and the MCS and PCS and overall quality of life scores. Females and graduates had significantly higher scores on the same subdomains. In addition, we found that gender, education level, BMI, income level and dietary consultation variables were statistically significantly associated with nutritional literacy. We think our findings support the hypothesis that “Nutrition literacy is a modifiable lifestyle risk factor and addressing literacy-related barriers may help improve health outcomes, including quality of life

Our study did not explore the duration of obesity nor the attempt to lose weight. In a study investigating the impact of obesity on quality of life, obese individuals with comorbidities endured a significant impact on both the emotional and physical aspects of their health. The presence of obesity as a comorbidity leads to a significant deterioration in physical well-being. Similarly the given study did not investigate the duration of obesity or the participants' attempts to lose weight. These factors are essential to interpret the relationship between BMI and health-related quality of life (14). In a cross-sectional study by Özenoğlu et al.(5) which had similar results to our study in terms of nutritional literacy level, concluded that nutrition literacy positively affected healthy eating attitudes and BMI (p<0.05). Quality of life and BMI are two important health markers that affect each other. The level of nutritional literacy can be modified, which affects these two factors. We think this shows the importance of determining the level of nutrition literacy specific to the community.

Our research found a positive correlation between nutrition literacy and dietician consulting. Correspondingly, a prospective cohort study by Navarra University revealed that quality of life was inferior in overweight and obese individuals compared to individuals of average weight both at baseline and at two years of follow-up. Their analysis illustrated that obesity negatively impacted the health-related quality of life, affecting the physical aspect more significantly than the

psychosocial (15). Research supports the claim that nutrition literacy is higher in females compared to males (5) which was confirmed by our study findings. Hence, we may interpret these findings as females being more involved in food preparation. In a study conducted to investigate the effect of gender on food choices, women were more invested in weight control and had stronger beliefs about healthy food consumption (16). However, the other studies report that BMI and food choice values, nutritional knowledge, cooking, and eating skills are generally weakly correlated (17-19).

Research shows that increased knowledge and nutrition literacy has a significant effect on changing individuals' perception towards a healthy diet nutrition model (20). Similarly, in our study, consulting a dietitian (B=2.01).; p<0.001) positively correlated with nutrition literacy. Hence, nutrition education from a reliable source can positively affect nutrition literacy and lead to healthy eating (7). According to the 2018 Food and Health Survey (n=1009) and the 2017 version of the same study, when inquired about which sources they trust, participants listed dietitians and nutritionists as the top two (21).

Income is an important indicator illustrating socioeconomic status's effect on nutrition literacy (22). Nutrition literacy increases with increasing income levels. One possible reason for this finding is that low-income households are less likely to seek information about their health and, therefore, less likely to cultivate sufficient nutrition literacy (23). In contrast, a study of 1165 Japanese adults aged 18-64 reported that nutrition knowledge was not significantly associated with education or household income (24).

In one study, higher digital dietary literacy (DDL) and healthy eating behavior scores correlated with a greater likelihood of having stable mental health and quality of life during the pandemic. (25). Cesur et al. (11) evaluated the quality of life with the WHOQOL-BREF (World Health Organization Quality of Life Instruments) scale and found a weak positive correlation between the physical, mental, and social quality of life score. In our study, the participants' MCS scores, age, gender, marital status, education level, employment status, lifestyle, income level, comorbidities, and nutrition literacy levels were statistically significantly correlated ($p < 0.05$ and $p < 0.001$). Besides, in alignment with the literature, we found that the PCS and MCS quality of life scores of the participants with sufficient nutrition literacy were high.

Since nutritional needs are affected by variables such as age, gender, health status, and physical activity, we believe that nutrition literacy will affect everyone differently.

Developmental stages such as childhood, adolescence, and elderliness may be among the groups most affected by the impact of nutrition literacy on quality of life. Our study also found that MCS-related quality of life increased as participants' age, education, income, and nutrition literacy level increased. Several studies conducted during the pandemic reported that higher food literacy levels might be associated with greater self-control, less impulsivity, and healthier food consumption (26, 27). In our study, the variables of age, gender, marital status,

education level, BMI, lifestyle, income level, presence of other diseases, and nutrition literacy level of the participants statistically significantly correlated with PCS scores [B=0.91(95%CI:0.71;1.1), t=9.2, (p<0.05) and p<0.001)]. Our results illustrate that improving nutrition literacy can positively change the quality of life. However, further research in more heterogenous group both locally and globally may be neeed to confirm our findings.

Study Limitations and Strengths: Our study presented several strengths, including the large sample size and the standardized NUTS classification. However, our study's limitations include using an online survey limiting access to those with the internet; as such, users are likely to have higher levels of education and higher rates of computer literacy. Furthermore, more than half of our participants (59.6%) had graduate-level education, and two-thirds (75%) of our study population were females. The above may have resulted in our study's high nutrition literacy levels. Moreover, our sample consisted of 66.56 % of individuals living in the cities of Ankara, İzmir, and İstanbul, with a high household expenditure on education. Lastly, the snowball sampling method hinders the study's generalizability, and the possibility that the people who consented were those interested in nutrition may have introduced self-selection bias. In order to eliminate the limitations in our study, studies focusing on wider sociocultural distribution should be planned in the future by using face-to-face survey method.

We calculated BMI based on self-reported body weight and height. As previous studies have shown that the BMI calculated from the person's declared weight and height correlates highly with the BMI calculated from the measured values (28). Therefore, BMI calculated from self-reported weight and height is a reliable measure for correlation analysis.

Our study presented several strengths, including the large sample size and the standardized NUTS classification.

Conclusions

At the end of this study, it was seen that as the nutritional literacy level of the participants increased, their quality of life also increased. Therefore, this study confirms that improving nutrition literacy may positively affect the quality of life.

Healthy eating habits can be accomplished by establishing a baseline and increasing nutrition literacy. The family is a minor social structure where parents can shape their members' eating patterns if they possess sufficient nutrition literacy. The Ministry of Family and Social Policies, the Ministry of National Education, and the Ministry of Health need to collaborate to systematically improve the nutrition literacy of the public by fully leveraging the media. Nutrition literacy, a subcategory of health literacy, is a predecessor to quality of life. An effective plan encompasses assessing the baseline nutrition literacy, establishing targets for improvement, effectively monitoring, and reporting on key performance indicators, and providing customized training to individuals. Increasing the awareness of health professionals on this issue and mandating the topic of nutrition literacy in their curriculum will strengthen communication and understanding between providers and their

patients. In the future, there is a need for large-scale studies investigating public and health professionals' nutrition literacy and health literacy levels.

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