Evaluation of the Relationship Between Nutrition Literacy and Health Literacy in Adults

Yetişkin Bireylerde Beslenme Okuryazarlığı ve Sağlık Okuryazarlığı Arasındaki İlişkinin Değerlendirmesi

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ABSTRACT

Aim: This study aims to determine the relationship between nutrition literacy (NL) and health literacy (HL) of adults.

Subjects and Method: This cross-sectional study included 450 individuals aged 18-65 years residing in Antalya. A questionnaire including socio-demographic characteristics, health status, nutritional habits, Turkish Health Literacy Scale-32, and the Evaluation Instrument of Nutrition Literacy on Adults was applied to the subjects by face-to-face interview technique and anthropometric measurements were taken.

Results: The mean age of the participants was 34.3±13.14 years. While more than half of them had inadequate (14.2%) and problematic-limited HL (37.6%), 87.3% of them were found to have adequate NL. Mean NL scores of women were found to be significantly higher than men (27.9±2.76; 26.5±3.32, p<0.001, respectively). Most of participants with adequate NL had bachelor/ postgraduate education (p<0.001). Individuals with adequate NL have significantly higher HL levels and scores than those with limited NL (p=0.001 and p<0.001, respectively). A weak positive correlation was found between HL and NL (r=0.262; p<0.05). In the multivariate model, however, subjects with inadequate HL had higher levels of inadequate NL (OR: 2.498; 95% CI: 1.284-4.859; p=0.007) and poor general nutritional knowledge (OR: 1.858; 95% CI: 1.151-2.998; p=0.011).

Conclusion: According to the results of our study, it was observed that the HL scale, which was adapted to Turkish to assess HL, was insufficient in assessing NL, since there was a low correlation between NL and HL.

Keywords: Nutrition literacy, health literacy, adult

ÖZET

Amaç: Bu çalışma yetişkinlerin beslenme okuryazarlığı (BOY) ve sağlık okuryazarlığı (SOY) arasındaki ilişkiyi belirlemek amacıyla planlanmıştır.

Bireyler ve Yöntem: Kesitsel tipteki bu araştırma Antalya'da ikamet eden 18-65 yaş arası, 450 birey üzerinde yürütülmüştür. Bireylere sosyo-demografik özellikler, sağlık durumu, beslenme alışkanlıkları ile Türkiye Sağlık Okuryazarlığı Ölçeği-32 ve

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Yetişkinlerde Beslenme Okuryazarlığı Değerlendirme Aracının bulunduğu anket formundaki sorular yüz yüze görüşme tekniği ile sorgulanmış ve antropometrik ölçümleri alınmıştır.

Bulgular: Çalışmaya katılan bireylerin yaş ortalaması 34.3±13.14'dür. Çalışmaya katılan bireylerin yarıdan fazlası yetersiz (%14.2) ve sorunlu-sınırlı SOY'ye (%37.6) sahip iken, %87.3'ünün yeterli BOY'ye sahip olduğu saptanmıştır. Kadınların ortalama BOY puanları erkeklerden anlamlı olarak daha yüksek (sırasıyla 27.9±2.76; 26.5±3.32, p<0.001) bulunmuştur. Yeterli BOY'a sahip olan bireylerin çoğunluğunun lisans/lisansüstü eğitimine sahip olduğu belirlenmiştir (p<0,001). Yeterli BOY olan bireylerin sınırlı BOY olan bireylere göre SOY düzeyleri ve puanları anlamlı olarak daha yüksektir (sırasıyla p=0.001, p<0.001). SOY ile BOY arasında pozitif yönde zayıf bir korelasyon olduğu saptanmıştır (r=0.262; p<0.05). Çok değişkenli modelde yetersiz sağlık okuryazarlığı olan katılımcıların yetersiz beslenme okuryazarlığı (OR: 2.498; %95 GA: 1.284-4.859; p=0.007) ve yetersiz genel beslenme bilgisinin (OR: 1.858; %95 GA: 1.151-2.998; p=0.011) daha yüksek olduğu görülmüştür.

Sonuç: Çalışmamızdan elde edilen sonuçlara göre BOY ile SOY arasında düşük düzeyde bir ilişki bulunduğu için SOY'yi değerlendirmek için Türkçe'ye uyarlanan ölçeğin BOY'nin değerlendirmede yetersiz olduğu görülmüştür.

Anahtar kelimeler: Beslenme okuryazarlığı, sağlık okuryazarlığı, yetişkin

INTRODUCTION

Health literacy (HL), defined as "the degree to which individuals can acquire, process and understand basic health information and services needed to make appropriate health decisions," was first used by Scott Simonds in 1974 (1,2). Health literacy enables individuals to take more responsibility for preventing non-communicable diseases (NCDs), ensuring more effective use and reducing the cost of health services, and managing their health. Current evidence points to HL as one of the most promising and cost-effective approaches to preventing or treating NCDs (3). Health literacy is affected by many factors such as age, educational background, culture, language, socioeconomic status, income level, occupation, old age, family and social environment, and presence of chronic diseases (4). While many countries include HL as a primary priority in their policies and practices, HL is low, especially in those with low general education and income level, older people, and individuals with long-term health issues (3,4).

Although the concept of nutrition literacy (NL) emerged as a specific form of HL, the tools used to evaluate HL cannot adequately evaluate NL (5). Nutrition literacy is defined as "an individual's capacity to access, interpret and understand basic information and services related to nutrition to promote and maintain health, as well as the competence to use this information and related health-promoting services" (5,6). In recent years, awareness of the interaction between nutrition and health, growing diversity in the food industry, and the proliferation of alternatives for food consumption outside the home have revealed the importance of NL and caused an increase in interest in this subject (7). Individuals with an adequate level of NL need to have the abilities and skills in portion size, food preparation, making healthy food choices, reading, and understanding food labels, and accessing reliable sources of nutritional information. Socio demographic characteristics such as gender, age, educational background, socioeconomic status, and dietary habits affect the NL (5,7). For individuals to have adequate and balanced nutrition, NL should be at a satisfactory level.

With the dissemination of NL and HL, it will be possible to improve life quality and duration by preventing the formation of NCDs. To our knowledge, no study has been conducted in Türkiye to evaluate NL and HL in the same population. This study was conducted to determine the relationship between NL and HL in adults.

SUBJECTS AND METHOD

Study Population and Design

The sample of this cross-sectional study is at least 384 people with a 5% margin of error calculated by the sample size with an unknown population. The study, whose data were collected from October 2021 to February 2022, includes 488 people residing in Antalya, between the ages of 18-65 years, who are at least primary school graduates. Thirty-eight people who had deficiencies in the questionnaire were excluded from the study, and 450 people formed the research sample. This study was conducted by the guidelines outlined in the Declaration of Helsinki, and prior informed consent was obtained from all participants. Ethics committee approval of the study was obtained from Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (15.09.2021/KAEK-669).

Data Collection

The study subjects were asked the questions in the questionnaire form containing socio-demographic characteristics, health status, nutritional habits, Turkish Health Literacy Scale-32, and the Evaluation Instrument of Nutrition Literacy on Adults by face-to-face interview. In addition, anthropometric measurements such as body weight, height, waist, hip, and neck circumferences were taken. The body mass indexes (BMI) of all the participants were calculated.

Instruments

Turkish health literacy scale-32 (THLS-32): THLS-32 was developed by Okyay et al. (8), based on the conceptual framework developed by the European Health Literacy Research Consortium, to evaluate HL in literate people over the age of 15 years. The scale consists of two health-related dimensions (treatment and care, disease prevention, and health promotion) and four processes of obtaining information about health-related decision-making and practices (access, understanding, evaluation, and use). 0-25 points indicate inadequate HL, >25-33 points problematic-

limited HL, >33-42 points adequate HL, and >42-50 points perfect HL (8).

Evaluation instrument of nutrition literacy on adults (EINLA): The tool developed by Cesur et al. (5) to assess the NL of adults consists of 5 subgroups and 35 multiple-choice questions focusing on General Nutrition Knowledge (GNK), Reading Comprehension and Interpretation (RCI), Food Groups (FG), Portion Sizes (PS), Food Label and Numerical Literacy (FLNL). The total score of NL was evaluated as inadequate if between 0-11 points, limited if between 12-23 points, and adequate if between 24-35 (5,9).

Statistical Evaluation of Data

Qualitative data were calculated as numbers (n), and percentages (%), and quantitative data were calculated as mean, standard deviation, and median values. The compliance of the quantitative variables to the normal distribution was evaluated through the "Kolmogorov-Smirnov" test. Since the data did not display a normal distribution, Mann Whitney U test was used for comparisons. Also, Pearson Chi-Square test was used to compare qualitative data. Associated factors were analyzed using the Spearman correlation test. In assessing the strength of the relationship between the dependent and independent variables, Multiple logistic regression analysis was used for categorical variables, and linear regression analysis was used for quantitative variables. The odds ratio (OR) and 95% confidence interval were calculated, and the significance level was accepted as $p < 0.05$ in all statistical analyzes.

RESULTS

The general characteristics of the subjects are summarized in Table 1. The mean age was 34.3±13.14 years, 52.2% of the individuals were women, and 47.8% were men. It was determined that most of the individuals had high school and bachelor/postgraduate degrees. Based on the self-reported of the subjects, the most common diseases were diabetes

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and goiter (6.0%), hypertension (5.3%), digestive system and respiratory system diseases (5.1%), bone and joint diseases (4.0%), and cardiovascular diseases (3.8%). Only 1/9 of the subjects used vitamin and mineral supplements (n=52; 11.6%). It was determined that most of them used the supplement due to vitamin/mineral deficiency (n=30) and the most used supplements were vitamin D (n=23), vitamin B_{12} (n=9), and multivitamin and minerals (n=9), respectively (data not shown).

More than half of the study participants had inadequate (14.2%) and problematic-limited HL (37.6%). However, approximately one out of nine participants had limited NL (12.7%) (Table 1).

The mean body weight, BMI, waist, hip and neck circumferences, and classification of BMI of the subjects by gender were shown in Table 2. While the majority of women (52.3%) were within the normal BMI range, it was found statistically significant that the majority of men were overweight and obese (59.1%) (p<0.001) (Table 2).

When the subjects' socio-demographic characteristics, anthropometric measurements, and HL classification were evaluated based on NL classification, more women had adequate NL than men (p=0.002). In comparison, NL scores of women were significantly higher than men (respectively 27.9±2.76; 26.5±3.32, p<0.001), but no significant difference was observed in HL scores (data not shown). Most individuals with adequate NL had received bachelor/postgraduate education. Nevertheless, most of those with limited NL were high school graduates (p<0.001). Individuals with adequate NL had higher HL levels and scores than individuals with limited NL (p=0.001, p<0.001, respectively). BMI, waist circumference and waist/hip ratios of those with high NL were lower but only significant waist/hip ratios (p=0.001) (Table 3).

Table 4 shows the correlation between HL and NL and their sub-dimensions. It is seen that there is a weak positive correlation between total HL score and total NL score (r=0.262; p<0.05).

Table 1. General characteristics of the study population

Variables	n	%
Gender		
Female	235	52.2
Male	215	47.8
Marital Status		
Married	228	50.7
Single	222	49.3
Education Status		
Primary school	47	10.4
Secondary school	16	3.6
High school	166	36.9
Bachelor/ Postgraduate degree	221	49.1
Working Status		
Employee	210	46.7
Unemployed	240	53.3
Using Vitamin-Mineral Supplements		
Yes	52	11.6
No	398	88.4
Smoking		
Yes	124	27.6
No	326	72.4
Alcohol Use		
Yes	110	24.4
No	340	75.6
Having Chronic Disease		
Yes	130	28.9
No	320	71.1
NL Classification		
Inadequate NL	-	-
Limited NL	57	12.7
Adequate NL	393	87.3
HL Classification		
Inadequate HL	64	14.2
Problematic-limited HL	169	37.6
Adequate HL	126	28.0
Perfect HL	91	20.2

Scale Scores	Median	X̄±SD
HL Score	32.8	33.3±9.55
Treatment and care	33.3	34.4±9.21
Disease prevention and health promotion	32.3	32.3±10.95
NL Score	28.00	27.2 ± 3.1
General nutrition knowledge	9.00	8.40 ± 1.53
Reading comprehension and interpretation	5.0	4.4 ± 0.77
Food groups	10.0	9.8 ± 0.47
Portion sizes	2.0	1.6 ± 0.81
Food label and numerical literacy	3.0	3.1 ±1.68

HL; health literacy, NL; nutrition literacy

Table 2. Anthropometric measurements of the participants

Anthropometric Measurements	Male $\bar{X}\pm SD$ (Median)	Female $\bar{X}\pm SD$ (Median)	p*
Weight (kg)	83.2±15.37 (80.0)	63.9±12.22 (62.0)	<0.001
Height (cm)	177.3±7.01 (177.0)	162.9±5.98 (163.0)	<0.001
BMI (kg/m^2)	26.5±4.57 (25.8)	24.3±5.21 (23.3)	<0.001
Waist circumference (cm)	94.1±14.81 (94.0)	79.6±15.07 (75.0)	<0.001
Hip circumference (cm)	100.2±12.16 (100.0)	98.8±13.54 (98.0)	0.063
Neck circumference (cm)	37.6±4.82 (38.0)	32.5±3.86 (32.0)	<0.001
Classification of BMI	**Male n (%)**	**Female n (%)**	
Underweight (<18.5 kg/m^2)	4 (1.9)	24 (10.2)	
Normal (18.5-24.99 kg/m^2)	84 (39.1)	123 (52.3)	<0.001**
Overweight (25.0-29.99 kg/m^2)	87 (40.5)	57 (24.3)	
Obese (≥30 kg/m^2)	40 (18.6)	31 (13.2)	

*BMI; body mass index, * Mann-Whitney U; ** Chi-squared test, p<0.05.*

Table 3. Socio-demographic characteristics, health literacy classification, and anthropometric measurements according to nutrition literacy classification

	Limited NL		Adequate NL		p
	n	**%**	**n**	**%**	
Gender					
Female	19	33.3	216	55.0	**0.002***
Male	38	66.7	177	45.0	
Education Status					
Primary school	13	22.8	34	8.7	
Secondary school	2	3.5	14	3.6	**<0.001***
High School	32	56.2	134	34.1	
Bachelor/Postgraduate education	10	17.5	211	53.6	
Marital Status					
Single	25	43.9	197	50.1	0.376
Married	32	56.1	196	49.9	
Having Chronic Disease					
No	43	75.4	277	70.5	0.441
Yes	14	24.6	116	29.5	
Classification HL					
Inadequate HL	16	28.1	48	12.2	
Problematic-limited HL	25	43.9	144	36.6	**0.001***
Adequate HL	13	22.8	113	28.8	
Perfect HL	3	5.3	88	22.4	
	$\bar{X}\pm SD$ (Median)		**$\bar{X}\pm SD$ (Median)**		
Age	33.7±14.34 (27.0)		34.4±12.98 (32.0)		0.411
HL	27.3±10.87 (29.7)		34.2±9.03 (33.3)		**<0.001†**
Weight (kg)	76.8±19.41 (75.0)		72.6±16.38 (72.0)		0.117
BMI (kg/m^2)	25.9±5.28 (25.5)		25.2±5.00 (24.5)		0.275
Waist circumference (cm)	90.3±15.21 (89.0)		86.0±16.74 (87.0)		0.060
Waist/Hip ratio	0.93±0.13 (0.92)		0.86±0.12 (0.86)		**0.001†**
Neck circumference (cm)	34.7±5.51 (34.0)		34.9±4.97 (35.0)		0.829

HL; Health literacy, NL; Nutrition literacy, BMI; Body mass index
*Pearson Chi-Square, †Mann Whitney-U; p<0.05

Univariate and multivariate logistic regression analyses were performed to determine the effect of low HL on low NL. Univariate analyzes suggest that low HL is associated with low NL and sub-headings of GNK, reading FL, and basic math. Multivariate models adjusted for age, gender, educational background, marital status, comorbidity, alcohol consumption, and BMI show that participants with poor HL are more likely to have poor NL (OR: 2.498; 95% CI: 1.284-4.859; p=0.007) and poor GNK (OR: 1.858; 95% CI: 1.151-2.998; p=0.011) (Table 5).

DISCUSSION

It is known that poor HL, including NL, plays a critical role in the formation of diseases (10). In recent years, the importance of NL and HL has started to increase in preventing NCDs or providing effective treatment. Studies on NL and HL have only recently begun in Türkiye. Most of the studies on NL are centered around

the development of scales for NL and adapting these scales to different languages. In addition, they have been used in research on evaluating the nutritional status of adults and individuals with chronic diseases (10-12). In Türkiye, most studies on NL include adolescents, and the number of those evaluating NL and HL in adults is quite limited (13,14). Moreover, no study analyzes the relationship between NL and HL in the same population. This study aims to determine the relationship between NL and HL in adults.

Inadequate NL and HL are associated with high rates of obesity (15,16). Natour et al. (15) found that 13.8% of individuals were overweight, 5.7% were obese, and the rate of low NL was 29%. According to the National Household Health Survey – Prevalence of NCDs Risk Factors in Türkiye (STEPS, 2017), the prevalence of overweight individuals is 35.6% and that of obese individuals is 28.8%, and the mean BMI is 26.4 ± 4.5 kg/m^2 in men and 28.9 ± 6.4 kg/m^2 in women (17). This

Table 4. The correlation between health literacy and nutrition literacy

Parameters	Total HL scores	TC	DPHP	Total NL scores	GNK	RCI	FG	PS	FLNL
Total HL scores	-								
TC	0.925[†]	-							
DPHP	0.944[†]	0.773[†]	-						
Total NL scores	0.262*	0.303[†]	0.194[†]	-					
GNK	0.250*	0.262[†]	0.200[†]	0.666[†]	-				
RCI	0.121[†]	0.149[†]	0.079	0.406[†]	0.186[†]	-			
FG	-0.14	0.006	-0.037	0.165[†]	0.028	0.033	-		
PS	0.034	0.042	0.024	0.350[†]	0.077	-0.021	-0.037	-	
FLNL	0.201*	0.238[†]	0.148[†]	0.754[†]	0.250[†]	0.157[†]	0.037	0.069	-

DPHP; Disease prevention and health promotion, FG; Food groups, FLNL; Food label and numerical literacy, GNK; General nutrition knowledge, PS; Portion sizes, RCI; Reading comprehension and interpretation, TC; Treatment and care; Spearman correlation test, *p<0.05; †p<0.001

Table 5. The effect of health literacy on inadequate nutritional literacy and its subscales

Factors	Crude model		Adjusted model*	
	OR (95% CI)	p	OR (95% CI)	p
Total NL Scores	2.683 (1.457-4.940)	**0.002**	2.498 (1.284-4.859)	**0.007**
General nutrition knowledge	1.901 (1.229-2.940)	**0.004**	1.858 (1.151-2.998)	**0.011**
Reading comprehension and interpretation	1.282 (0.883-1.860)	0.192	1.262 (0.853-1.867)	0.245
Food groups	-	-	-	-
Portion sizes	0.981 (0.587-1.640)	0.943	0.876 (0.515-1.492)	0.626
Food label and numerical literacy	1.641 (1.070-2.517)	**0.023**	1.363 (0.860-2.162)	0.188

*Each model was adjusted with gender, age, education level, marital status, comorbidity, alcohol, and BMI.

study suggests that the prevalence of overweight and obese individuals is lower than in the STEPS study, and the mean BMI is similar in men but lower in women. According to the results of the Turkey Nutrition and Health Survey (TNHS)-2017, the mean waist and hip circumferences are 95.0±12.93 cm and 103.6±8.70 cm in men aged 19-64, and 90.2±15.50 cm and 106.6±12.43 cm in women (18). This study shows that men's mean waist circumferences are similar to Türkiye's average; however, hip circumference and women's mean waist and hip circumferences are lower. Likewise, the mean neck circumference, recognized as an indicator of obesity in recent years, is lower in both gender. According to our study results, the mean neck circumference and BMI are 32.5±3.86 cm and 24.3±5.21 kg/m^2 in women and 37.6±4.82 cm and 26.4±4.57 kg/m^2 in men, which is similar to the study of Ben-Noun et al. (19). The waist/hip ratio, one of the indicators of abdominal obesity, which is critical in the formation of many diseases, is similar to the STEPS study (0.93) in men and lower than TNHS-2017 (0.98±0.08). In women, the waist/hip ratio was lower compared to both STEPS (0.86) and TNHS (0.91±0.08) (17,18). The reason why women's BMI, waist, hip, and neck circumference, and waist/hip ratio measurements were lower than men in this study compared to Türkiye's average may be related to the higher HL and NL scores and higher education levels of the women in our sample.

Studies in the literature show that insufficient HL level varies by 36% in the USA and 1.8-26.9% in Europe. Adequate HL level is 23.5% in Bulgaria and Türkiye, 23.8% in Germany, and 39.2% in Italy (2,20,21). A study evaluating the HL levels of adults in Türkiye suggests that 24.8% of the subjects have adequate, 5.8% have excellent, and 27.2% have low HL levels. Another study found that 35.4% of the population had an adequate and satisfactory level of HL (8,22). Our study found that the participants' inadequate HL level was lower than the studies conducted in our country; on the other hand, participants' adequate-excellent HL level was higher than those shown in our country.

This may be related to the study sample of younger and more educated individuals.

Studies in the literature show that adequate NL levels vary by 65.2% (13), 80.8% (23), 89.2% (24), and one study found adequate NL levels to be 29% (15). A study in Norway found that being female, studying or working in the Faculty of Health Sciences, being older, and being more physically active was associated with higher NL levels (25). It is thought that the difference in NL levels and scores in studies conducted around the world may be due to the use of different NL scales for evaluating NL in studies.

The studies investigating NL in Türkiye a line with our results and suggest that women's NL scores are significantly higher than men's and there is a significant relationship between NL levels and gender and BMI values (14,15,26). In the study of Özdenk and Özcebe (27), contrary to our study, approximately one-third of the participants (32.1%) were found to have adequate NL levels. However, this rate was 79.8% in another study (9). Another study determined that 94.4% of the subjects had a adequate level of NL and that there was a significant negative relationship between BMI and NL (p<0.05) (28). A study conducted in Elazığ showed that 52.9% of the individuals had adequate NL levels, and considering the factors affecting NL, better educational status led to an increase in NL levels, like this study (29). In this study, it is thought that the subjects' adequate NL levels were higher than those in many studies in the literature, and this may be since the subjects were younger, more educated, and most of them were women.

Although NL and HL overlap in many sub-headings, it is argued in the literature that the scales used for HL will not be adequate for NL (30,31). The results of our study also support this opinion. General nutritional knowledge, reading comprehension, and label reading, which are the sub-headings of the NL scale, show weak but significant correlations with HL. Nevertheless, no relationship was found between FG, PS, and HL. In univariate analyses, this relationship

was also associated with inadequate levels of HL and NL and sub-headings of GNK and label reading. In the multivariate model, participants with low HL had higher levels of low NL and poor GNK.

The limitation of our study is that the sample of the study consisted only of individuals living in Antalya province and the results could not reflect the general population. Our research results indicated that the THLS-32, adapted to Turkish to evaluate HL, was insufficient in evaluating NL. We found a low but significant correlation between EINLA and THLS-32. Since there is no study investigating the relationship between NL and HL in Türkiye, it is thought that the results of this study will guide future studies in the definition and evaluation of the relationship between NL and HL. More studies are needed to understand the relationship between HL and NL.

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Conflict of interest • Çıkar çatışması: The authors declare that they have no conflict of interest. • Yazarlar çıkar çatışması olmadığını beyan ederler.

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