FOOD and HEALTH

FOOD and HEALTH
E-ISSN 2602-2834

Food and Health 10(4), 286-295 (2024) • https://doi.org/10.3153/FH24027 *Research Article*

Investigation of nutrition literacy and quality of life in adults

Hilal ER DÖNGEL[1], **Yahya ÖZDOĞAN**[2]

Cite this article as:
Er Döngel, H., Özdoğan, Y. (2024). Investigation of nutrition literacy and quality life in adults. *Food and Health,* 10(4), 286-295. https://doi.org/10.3153/FH24027

[1] Kütahya Evliya Çelebi Training and Research Hospital, Unit of Nutrition and Diet, Kütahya, Türkiye

[2] Ankara Yıldırım Beyazıt University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Ankara, Türkiye

ORCID IDs of the authors:
H.E.D. 0000-0002-0028-3042
Y.Ö. 0000-0002-4697-8042

Submitted: 01.05.2024
Revision requested: 09.07.2024
Last revision received: 09.07.2024
Accepted: 13.08.2024
Published online: 16.09.2024

Correspondence:
Hilal ER DÖNGEL
E-mail: dyt.hilaler@gmail.com

Available online at
http://jfhs.scientificwebjournals.com

ABSTRACT

This study aimed to investigate the relationship between nutrition literacy (NL) score and quality of life (QoL) score for adults aged 19-64. The study included 430 adults. Data were collected through a questionnaire, the Evaluation Instrument of Nutrition Literacy on Adults (EINLA), and the European Health Impact Scale (EUROHIS). Sociodemographic data, anthropometric measurements, and biochemical parameters of adults were collected. The data were interpreted by T-test, One-Way Analysis of Variance (ANOVA), Chi-squared Test, and Pearson correlation analysis through the SPSS 21.0 IBM package program. 59.8% of participants had sufficient NL. Participants with enough EINLA scores had significantly lower body weight, body fat mass, fasting blood glucose, and triglyceride. The mean EUROHIS scores of participants with bachelor/postgraduate degrees were considerably higher than those with primary school graduates. A negative correlation was found between the age and BMI of the participants and their NL scores. It has been shown that there is a very weak positive correlation between the NL score and the QoL level of adults. As the NL level of adults increases, the QoL is expected to improve. According to the findings obtained from the research, it is necessary to increase the community's level of NL.

Keywords: Literacy, Nutrition, Nutrition literacy, Quality of life.

Introduction

According to the World Health Organization (WHO), health is a state of complete physical, mental, and social well-being (WHO, 1948). Although many factors affect health, nutrition is a critical part of health (WHO, 2018). Among the reasons that prevent sufficient and balanced nutrition, the low nutrition literacy (NL) level of adults is an important factor (Kadıoğlu, 2019).

Nutrition literacy is an adult's ability to access, understand and interpret food and nutrition information and to apply this information to his/her life. Increasing the level of NL contributes to accessing accurate information about nutrients, making and implementing healthy nutritional decisions, and protecting and maintaining an adult's health (Aktaş & Özdoğan, 2016).

Quality of life (QoL) is defined as how a person perceives his/her place in life in terms of the culture and values in which he/she lives within the framework of his/her life goals and expectations (WHO, 2012). The prolonged life expectancy of the public has made QoL more important (Eser, 2014). Adults need to be nutritionally literate at a sufficient level for the prevention and management of nutrition-related diseases that negatively affect QoL (T.C. Sağlık Bakanlığı, 2015).

There is a strong relationship between nutrition and QoL. A better QoL can be maintained with a sufficient and balanced diet (Şahin, 2014). It is thought that the QoL can be improved with an increase in the level of NL of the public (Rochman et al., 2018). The study aimed to determine the relationship between NL levels and adult QoL.

Materials and Methods

Objective and Type

This cross-sectional study was conducted with 124 males and 306 females between May 6, 2019, and January 6, 2020, at Kütahya Evliya Çelebi Training and Research Hospital to determine the relationship between NL levels and QoL in adults.

Sample of the Study

GPOWER 3.1 package program was used to determine the sample size. As a result of the calculations made by taking the 95% confidence level, 0.05 margin of error and the power of the test (1-β) 0.80 (effect size=0.2447225), the minimum sample size was determined as 416 people. Four hundred thirty voluntary adults between the ages of 19-64 years, who were at least in primary school, not pregnant and not wearing a pacemaker and who applied to the diet outpatient clinic for the first time, participated in the study.

Data Collection

Data were obtained using a personal information questionnaire, the Evaluation Instrument of Nutrition Literacy on Adults (EINLA) and the European Health Impact Scale (EUROHIS) (Cesur, 2014; Eser et al., 2011). Necessary permissions were obtained from the scale owners. The personal information questionnaire includes gender, age, education, health status, general characteristics, anthropometric measurements, dietary habits, physical activity status and blood tests (fasting blood glucose (FBG), total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL) and triglycerides) performed in the last 6 months.

The height of the participants was measured with a Mesilife brand height meter. Body weight, body fat mass and fat percentage were measured using a Jawon X-Contact bioelectrical impedance analyser (BIA). Body mass index (BMI) was calculated according to the formula "body weight (kg) / height^2 (m^2)" using body weight and square meters of height. World Health Organization values were taken as a reference in the evaluation of the BMI of the participants (WHO, 2023).

Instruments

Evaluation instrument of nutrition literacy on adults (EINLA): The EINLA, the validity and reliability of which was performed by Cesur, Kocoglu and Sumer (2015), consists of five subsections and a total of 35 questions. The first sub-section consists of 10 questions on general nutrition information, the second sub-section consists of 6 questions on reading comprehension, and the third sub-section consists of 10 questions on food groups. The fourth sub-section consists of 3 questions on portion sizes, and the fifth sub-section consists of 6 questions on food labelling and numerical literacy (Cesur et al., 2015). Each correct answer is worth one point. In total, scores between 0-11 were reported as insufficient, 12-23 as borderline, and 24-35 as sufficient (Cesur, 2014). Cronbach's alpha on this scale was 0.76 in this study.

European health impact scale (EUROHIS): EUROHIS is a QoL scale comprising eight questions. Responses to survey items were based on a five-point Likert type (1 = not at all; 5 = completely). The EUROHIS total score is formed by a simple summation of scores on the eight items.

As the scale score increases, the QoL increases. Eser et al. (2011) performed its validity and reliability. In this study, Cronbach's alpha on this scale was 0.77.

Statistical Analysis

The data obtained in this study was evaluated through SPSS 21.0 IBM (Statistical Program for Social Sciences) program. The Kolmogorov-Smirnov test was utilised to assess the normal distribution conformity of the quantitative data. Since the sample group was normally distributed, parametric tests were used. Descriptive statistical methods were used to analyse sociodemographic data: T-test (t), One-Way Analysis of Variance (ANOVA) (F), and Chi-squared test (X^2) were used to compare groups. The Pearson Correlation analysis (r) method was used to determine the relationship between variables. The results were considered statistically significant for $p<0.05$.

Ethical Dimension of the Research

Permission was obtained from Kütahya Health Sciences University Non-Interventional Clinical Research Ethics Committee (Decision no: 2019/04, Date: 19.03.2019). Institutional permission was obtained from the Kütahya Evliya Çelebi Training and Research Hospital administration. This study was conducted by the guidelines outlined in the Declaration of Helsinki. Data collection started after informed consent was obtained from all participants.

Results and Discussion

Among the adults who participated in the study, 71.2% were female, 35.6% were between the ages of 34 and 48, and 35.1% had bachelor/ postgraduate degrees. Participants with at least one chronic disease diagnosed by a doctor comprised 63.5% of the sample. The BMI distribution of the participants showed that 37.7% were obese and 30.7% were overweight (Table 1).

When the scores obtained from the EINLA are analysed, 59.8% of the adults are at the sufficient NL level. While 62.1% of the participants were inadequate for the fifth section and 44.9% for the fourth section (Table 2). Nutrition literacy is one of the most important points for adults in public to exhibit sufficient and balanced nutrition behaviours (Ünal, 2017). In this study, the NL of 59.8% of the participants was sufficient. In various studies, the rate of sufficient NL varies between 32.1% and 94.4% (Cesur, 2014; Özdenk & Özcebe, 2018; Pınarlı, 2019; Uzun, 2019; Ünal, 2017). This may be due to methodological differences in the studies, the scales used, and the dates of the studies. Similar to the finding in this study, Son's study on adults in Afyonkarahisar reported that 61.4% of the participants were nutritionally literate at a sufficient level (Son, 2023). Unal showed that 94.4% of adults had sufficient NL. Unal's study was conducted with adults who applied to the obesity counselling unit (Ünal, 2017). Therefore, it is thought that adults may have a high level of awareness about nutrition and, therefore, a high level of NL. In another recent study, 81.8% of adults were nutritionally literate. Since the study by Demirer and Yardımcı (2023) was conducted on adults working at universities, this rate may have been high. In the study conducted in Kırşehir, the percentage of adults with a sufficient level of NL (32.1%) (Özdenk & Özcebe, 2018) was lower than in this study, which may be due to the difference in the socio-economic development levels of the cities where the research was conducted.

Participants were analysed in three groups: sufficient, borderline, and insufficient regarding EINLA scores. While no significant difference was found between genders ($p=0.142$), a significant difference was found in terms of age groups, education level, disease and BMI group ($p<0.001$) (Table 3). Participants with sufficient EINLA scores are mostly distributed in the 19-33 age group (45.1%) and bachelor/ postgraduate degrees (52.5%). In contrast, those with insufficient scores are mostly distributed in those with disease (85%) and obese people (60%).

Supporting the finding in this study, Unal also found no difference between genders (Ünal, 2017). In many studies, the NL of women was found to be higher (Kalkan, 2019; Michou et al., 2019; Son, 2023; Demirer & Yardımcı, 2023). The lack of difference between genders in this study may be because men are now involved in cooking and food shopping in our public.

In this study, in parallel with the literature, the distribution of people with sufficient NL level was in the group of bachelor/postgraduate degrees (Cesur, 2014; Spronk et al., 2014; Ünal, 2017; De Vriendt, Matthys, Verbeke, Pynaert & De Henauw, 2019; Michou et al., 2019). As an adult's educational level increases, nutritional knowledge increases (Cesur, 2014; Zoellner et al., 2019).

The nutritional knowledge level of an adult may be effective in preventing nutrition-related diseases (Madalı et al., 2017). In this study, it was noted that adults with chronic diseases exhibited inadequate NL levels. A low level of NL may make a person more vulnerable to developing the disease. Cesur showed no relationship between chronic disease status and NL level (Cesur, 2014). Unal stated that adults with chronic diseases had higher NL levels (Ünal, 2017).

Based on their EINLA scores, Table 4 shows the participants' mean anthropometric measures and biochemical parameters. It was determined that there was a significant difference between the groups in terms of body weight ($F=14.579$, $p<0.001$), body fat mass ($F=14.798$, $p<0.001$), FBG ($F=17.170$, $p<0.001$), and triglyceride ($F=3.701$, $p<0.05$) values. Participants with sufficient EINLA scores had significantly lower body weight, body fat mass, FBG, and triglyceride values than those with insufficient and borderline scores.

In this study, participants with sufficient EINLA scores had significantly lower body weight, body fat mass, fasting blood glucose and triglyceride values than insufficient and borderline scores. Mearns et al. showed a positive correlation between NL and high-density lipoprotein value (Mearns et al., 2017). Another study reported that people who received nutrition education had significantly lower fasting blood glucose levels, low-density lipoprotein and total cholesterol (Malek, 2010). It has been shown that NL may affect blood glucose and blood lipid profile.

When the QoL was compared according to the participants' general characteristics, no significant difference was observed in EUROHIS scores regarding gender, age group, disease status and BMI. There was a significant difference in EUROHIS total scores according to the education level of the participants ($p<0.05$). It was shown that participants in primary school had significantly lower EUROHIS total scores than those with bachelor/ postgraduate degrees (Table 5).

In this study, there was a significant difference in EUROHIS total scores according to the educational status of the participants. Akbal found that university graduates had higher EUROHIS scores (Akbal, 2010). Similarly, Eser et al. showed that adults with lower education levels had lower EUROHIS scores (2011). In parallel with the increase in an adult's education level, his/her economic income increases, and he/she can lead a better-quality life.

Table 6 shows the positive correlation between the total score and the first, second, and fifth subscale scores of the EINLA and EUROHIS total scores ($r=0.166$, $p=0.001$; $r=0.187$, $p<0.001$; $r=0.172$, $p<0.001$; $r=0.102$, $p<0.05$, respectively).

A negative correlation was discovered between age, all subsections, and the total scores of the EINLA. In parallel with this result, some studies have reported that the NL level decreases with age (Lassetter et al., 2015; Michou et al., 2019). This may be related to the fact that the elderly have more difficulty with math calculations, reading food labels, and portion calculations than younger people.

There was an inverse correlation between BMI and the first, second, third and fifth subsections and total scores of the EINLA. In parallel with the findings in this study, various studies have also shown a negative correlation between BMI and NL (Erem & Bektaş, 2023; Lassetter et al., 2015; Mearns et al., 2017; Pınarlı, 2019; Ünal, 2017). At the same time, it was found that adults with sufficient NL had lower body weight and fat mass. Mearns et al. (2017) and Pınarlı (2019) found a negative correlation between NL and body fat percentage in their studies. NL has the necessary knowledge about sufficient and balanced nutrition and contributes to an adult making the right food choices in this direction (Ünal, 2017).

This study demonstrated a weak positive correlation between the EINLA and EUROHIS scores. Some studies have shown a positive correlation between QoL and NL (Cesur, 2014; Erem & Bektaş, 2023). Sufficient and balanced nutrition improves QoL by preventing nutrition-related diseases and providing the best health status (Amarantos et al., 2001). People with sufficient knowledge about nutrition can pay more attention to their diets, read more food labels, and make more effort to choose healthy food when shopping for food. Thus, they can be protected from nutrition-related diseases and have a higher QoL.

Limitations

The study's limitations include the fact that only adults living in Kütahya were included in the sample, and the results cannot be generalised to the population. In addition, the study was conducted in a hospital and was based on self-report.

Table 1. Sociodemographic Characteristics and BMI Classification of the Participants (n:430)

	n	%
Gender		
Male	124	28.8
Female	306	71.2
Age group		
19-33	149	34.7
34-48	153	35.6
49-64	128	29.7
Education level		
Primary school	123	28.6
Secondary school	42	9.8
High school	114	26.5
Bachelor/ Postgraduate degree	151	35.1
Profession		
Housewife	135	31.4
Government employee	118	27.4
Self-employment	64	14.9
Labourer	53	12.3
Retired	23	5.3
Not working	37	8.7
History of disease		
Yes	273	63.5
No	157	36.5
Diseases *,†		
Obesity	162	34.0
Diabetes mellitus	83	17.4
Hypertension	75	15.7
Digestive System Diseases	53	11.1
Kidney Diseases	46	9.6
Cardiovascular Diseases	41	8.6
Other (Liver Diseases, Neurological Diseases)	17	3.6
BMI Group		
Underweight	15	3.5
Normal	121	28.1
Overweight	132	30.7
Obese	162	37.7
	mean±SD	
Age (years)	40.23±12.46	

*Participants marked more than one option. †Patient adults answered.

Table 2. Distribution of the Total and Subsection Scores of the Participants in the EINLA

	Insufficient		Borderline		Sufficient	
	n	%	n	%	n	%
EINLA total	20	4.7	153	35.6	257	59.8
EINLA Sub-section						
1. General Nutrition Information	11	2.6	135	31.4	284	66.0
2. Reading Comprehension	36	8.4	118	27.4	276	64.2
3. Food Groups	31	7.2	71	16.5	328	76.3
4. Size of Servings	193	44.9	169	39.3	68	15.8
5. Food Label and Numerical Literacy	267	62.1	110	25.6	53	12.3

EINLA: Evaluation Instrument of Nutrition Literacy on Adults

Table 3. Comparison of the General Characteristics of the Participants According to Their Scores in the EINLA

	Insufficient		Borderline		Sufficient			
	n	%	n	%	n	%	X^2	p
Gender								
Male	5	25.0	53	34.6	66	25.7	3.902	0.142
Female	15	75.0	100	65.4	191	74.3		
Age group								
19-33	1	5.0	32	20.9	116	45.1		
34-48	5	25.0	47	30.7	101	39.3	**70.275**	**<0.000***
49-64	14	70.0	74	48.4	40	15.6		
Education level								
Primary school	17	85.0	77	50.3	29	11.3		
Secondary school	1	5.0	24	15.7	17	6.6	**142.981**	**<0.000***
High school	1	5.0	37	24.2	76	29.6		
Bachelor/ Postgraduate degree	1	5.0	15	9.8	135	52.5		
History of disease								
Yes	17	85.0	116	75.8	140	54.5	**23.032**	**<0.000***
No	3	15.0	37	24.2	117	45.5		
BMI Group								
Underweight	-	-	2	1.3	13	5.0		
Normal	1	5.0	26	17.0	94	36.6	**45.508**	**<0.000***
Overweight	7	35.0	42	27.5	83	32.3		
Obese	12	60.0	83	54.2	67	26.1		

Chi-squared test. *p<0.001

Tablo 4. The Mean Anthropometric Measurements and Biochemical Parameters of the Participants According to the EINLA Scores.

Insufficient			Borderline		Sufficient			
	Mean	SD	Mean	SD	Mean	SD	F	p
Body weight (kg)	84.22	15.46	80.04	15.36	72.35	15.97	**14.579****	**<0.000**
Body fat mass (kg)	28.10	11.23	25.84	10.99	20.85	9.20	**14.798****	**<0.000**
FBG (mg/dl)	118.90	38.55	116.25	45.32	97.10	24.06	**17.170****	**<0.000**
Total cholesterol (mg/dl)	202.20	29.51	196.10	46.67	187.51	39.22	2.756	0.065
Triglycerides (mg/dl)	177.75	111.09	172.40	129.33	141.26	113.11	**3.701***	**0.025**
HDL (mg/dl)	46.90	6.68	47.75	10.45	49.79	10.56	2.262	0.105
LDL (mg/dl)	122.90	26.05	117.51	38.74	112.68	32.90	1.480	0.229

ANOVA test. *$p<0.05$,**$p<0.001$*

Table 5. Distribution of EUROHIS Total Scores According to General Characteristics of Participants

	EUROHIS total score (Mean ±SD)	t/F	p
Gender†			
Male	29.02±5.11	1.408	0.160
Female	28.26±4.77		
Age group‡			
19-33	28.32±4.47		
34-48	29.08±4.84	2.037	0.132
49-64	27.95±5.31		
Education level‡			
Primary school	27.47±5.61		
Secondary school	28.00±5.55	3.247	**0.022***
High school	28.76±4.79		
Bachelor/ Postgraduate degree	29.23±4.22		
History of disease†			
Yes	28.18±4.97	1.749	0.081
No	29.01±4.66		
BMI group§			
Underweight	28.27±3.84		
Normal	28.93±4.39	6.807	0.078
Overweight	29.08±4.78		
Obese	27.68±5.28		

EUROHIS: European Health Impact Scale
*p<0.05, †T-Test, ‡One-Way ANOVA

Table 6. Correlation Between Age, BMI, EUROHIS, and Sub-section and Total Scores of the Participants in the EINLA

	Age	BMI	EUROHIS Total score
EINLA Sub-section	**r**	**r**	**r**
1. General Nutrition Information	**-0.374**†	**-0.333**†	**0.187**
2. Reading Comprehension	**-0.296**†	**-0.250**†	**0.172**
3. Food Groups	**-0.264**†	**-0.229**†	0.081
4. Size of Servings	**-0.141**†	-0.058	0.063
5. Food Label and Numerical Literacy	**-0.430**†	**-0.400**†	**0.102**
EINLA total score	**-0.453**†	**-0.394**†	**0.166**

Pearson Correlation. BMI; Body mass index, EINLA; Evaluation Instrument of Nutrition Literacy on Adults, EUROHIS; European
Health Impact Scale
*p<0.05, †p<0.01

Conclusion

It is thought that the prevalence of obesity can be reduced by increasing the NL level of adults in the public. In this context, some policies should be established, and various training programs should be organised to increase the NL levels of adults in our country. Since the NL level of middle-aged and older adults and adults with chronic diseases is insufficient, nutrition training should be organised for these groups. Although the readability levels of the materials used in nutrition education should be considered, they must appeal to all individuals in the public. Nutrition education should be aimed at individuals applying what they have learned. It is important to increase the educational status of individuals to increase the public's QoL. As the NL level of the public increases, the QoL is also predicted to increase. It is recommended that experts should organise necessary training and conferences on nutrition. Thus, it is thought that the QoL of individuals in the public can increase. This study contributed to the literature as a study investigating the relationship between NL and QoL and shows that further studies with different populations are needed.

Compliance with Ethical Standards

Conflict of interest: The author(s) declares that they have no actual, potential, or perceived conflict of interest for this article.

Ethics committee approval: Permission was obtained from Kütahya Health Sciences University Non-Interventional Clinical Research Ethics Committee (Decision no: 2019/04, Date: 19.03.2019).

Data availability: Data will be made available on request.

Funding: The author has received no financial support for this work's research, authorship or publication.

Acknowledgements: -

Disclosure: This study was produced from Hilal ER DÖNGEL's master's thesis.

References

Akbal, A. (2010). Ankara Büyükşehir Belediyesi aile yaşam merkezine başvuran 60 yaş ve üzeri bireylerin beslenme ve sağlık durumlarının saptanması [Başkent University, Institute of Health Sciences, Department of Nutrition and Dietetics. Master's Thesis].

Aktaş, N., Özdoğan, Y. (2016). Gıda ve beslenme okuryazarlığı. *Harran Tarım ve Gıda Bilimleri Dergisi,* 20(2), 146-153. https://doi.org/10.29050/harranziraat.259105

Amarantos, E., Martinez, A., Dwyer, J. (2001). Nutrition and quality of life in older adults. *Journal of Gerontology: Biological Sciences,* 56(2), 54–64. https://doi.org/10.1093/gerona/56.suppl_2.54

Cesur, B., Koçoğlu, G., Sümer, H. (2015). Evaluation instrument of nutrition literacy on adults (EINLA): a validity and reliability study. *Integrative Food, Nutrition and Metabolism*, 2(3), 174-177. https://doi.org/10.15761/IFNM.1000114

Cesur, B. (2014). Sivas il merkezi yetişkin nüfusta beslenme okuryazarlığı durumu ve yaşam kalitesi ile ilişkisi [Cumhuriyet University, Institute of Health Sciences, Department of Public Health. Doctoral Thesis].

De Vriendt, T., Matthys, C., Verbeke, W., Pynaert, I., De Henauw, S. (2009). Determinants of nutrition knowledge in young and middle-aged Belgian women and the association with their dietary behaviour. *Appetite,* 52, 788–792. https://doi.org/10.1016/j.appet.2009.02.014

Demirer, B., Yardımcı, H. (2023). Nutritional literacy levels of university academic and administrative staff: A cross-sectional study from Turkey. *Nutrition and Health,* 0(0), 1-8. https://doi.org/10.1177/02601060231163922

Erem, S., Bektaş, Z. (2023). Genç erişkinlerde beslenme okuryazarlığı düzeyi yaşam kalitesi ile ilişkili midir?. *Food and Health*, 9(2), 129-138. https://doi.org/10.3153/FH23012

Eser, E., Lağarlı, T., Baydur, H., Akkurt, V., Akkuş, H., Arslan, E., Cengiz, E., Çiftçioğlu, G., Işık, H., Karabacak, H., Özkapu, T., Özyıldırım, E., Soybaş, H., Vural, O. (2011). EUROHİS (WHOQOL-8. Tr) Türkçe

sürümünün Türk toplumundaki psikometrik özellikleri. *Turkish Journal of Public Health,* 8(3), 136-152.

Eser, E. (2014). Sağlıkla ilgili yaşam kalitesinin kavramsal temelleri ve ölçümü. *Türk Nöroloji Dergisi*, 20(1), 1-4.

Kadıoğlu, B.U. (2019). Gıda ve beslenme okuryazarlığı ölçeklerin incelenmesi. *Sağlık Bilimlerinde Eğitim Dergisi,* 1(1), 13-20.

Kalkan, I. (2019). The impact of nutrition literacy on the food habits among young adults in Turkey. *Nutrition Research and Practice*, 13(4), 352-357. https://doi.org/10.4162/nrp.2019.13.4.352

Lassetter, J.H., Clark, L., Morgan, S.E. (2015). Health literacy and obesity among native Hawaiian and Pacific Islanders in the United States. *Public Health Nursing*, 32, 15-23. https://doi.org/10.1111/phn.12155

Madalı, B., Dikmen, D., Piyal, B. (2017). Beslenme bilgi düzeyinin değerlendirilmesinde sağlık okuryazarlığı yeterli mi?. *Beslenme ve Diyet Dergisi,* 45(2), 153-160.

Malek, M. (2010). Tip 2 diyabetli hastalara verilen beslenme eğitiminin beslenme bilgi ve alışkanlıkları üzerine etkisinin incelenmesi [Ankara University, Institute of Science and Technology, Department of Home Economics. Doctoral Thesis].

Mearns, G.J., Chepulis, L., Britnell, S., Skinner, K. (2017). Health and nutritional literacy of New Zealand nursing students. *Journal of Nursing Education,* 56, 43-48. https://doi.org/10.3928/01484834-20161219-09

Michou, M., Panagiotakos, D.B., Lionis, C., Costarelli, V. (2019). Socioeconomic inequalities in relation to health and nutrition literacy in Greece. *International Journal of Food Sciences and Nutrition*, 70(8), 1007-1013. https://doi.org/10.1080/09637486.2019.1593951

Özdenk, G.D., Özcebe, L.H. (2018). Bir üniversite çalışanlarının beslenme okuryazarlığı, beslenme davranışları ve ilişkili faktörler. *Turkish Journal of Public Health,* 16(3), 178-189. https://doi.org/10.20518/tjph.499902

Pınarlı, Ç. (2019). Kadınlarda beslenme okuryazarlığı ve beslenme durumu ile tip 2 diyabet riski arasındaki ilişkinin değerlendirilmesi [Acıbadem Mehmet Ali Aydınlar University, Institute of Health Science, Department of Nutrition and Dietetics. Master's Thesis].

Rochman, C., Nasrudin, D., Helsy, I., Hermit, N., Darmalaksana, W., Nasrullah. (2018). Nutrition literacy program for improving public wellness. *Journal of Physics: Conference Series,* 1028, 1-7. https://doi.org/10.1088/1742-6596/1028/1/012031

Son, N.E. (2023). Association of nutrition literacy level with sociodemographic data: Case of Afyonkarahisar. *Medicine Science,* 12(1), 264-270. https://doi.org/10.5455/medscience.2022.10.218

Spronk, I., Kullen, C., Burdon, C., O'Connor, H. (2014). Relationship between nutrition knowledge and dietary intake. *British Journal of Nutrition,* 111(10), 1713–1726. https://doi.org/10.1017/S0007114514000087

Şahin, M.A. (2014). Yetişkin bireylerde diyet kalitesi ile yaşam kalitesi arasındaki ilişkinin değerlendirilmesi [Hacettepe University, Institute of Health Science, Department of Nutrition and Dietetics. Master's Thesis].

T.C. Sağlık Bakanlığı, Halk Sağlığı Genel Müdürlüğü (2015). Türkiye Beslenme Rehberi TÜBER. https://okulsagligi.meb.gov.tr/meb_iys_dosyalar/2017_01/27102535_tyrkiye_beslenme_rehberi.pdf (accessed 02.03.2024)

Uzun, R. (2019). Üniversite Öğrencilerinde Beslenme okuryazarlığı durumu ve obezite ile ilişkisi [Erciyes University, Institute of Health Science, Department of Public Health. Master's Thesis].

Ünal, E. (2017). Bursa ili merkez ilçelerindeki sağlıklı yaşam merkezlerinin obezite danışma birimlerini tercih eden bireylerin beden kitle indeksleri ile beslenme okuryazarlıkları düzeyleri arasındaki ilişkisinin belirlenmesi [Bursa Uludağ University, Institute of Health Science, Department of Nursing. Master's Thesis].

World Health Organization (1948). Summary reports on proceedings minutes and final acts of the international health conference held in New York from 19 June to 22 July 1946. https://apps.who.int/iris/handle/10665/85573 (accessed 19.04.2024)

World Health Organization (2023). Body mass index (BMI). https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/body-mass-index (accessed 10.04.2024)

World Health Organization (2018). Nutrition. https://www.who.int/news-room/facts-in- pictures/detail/nutrition (accessed 19.04.2024)

World Health Organization (2012). WHOQOL: Measuring Quality of Life. https://www.who.int/tools/whoqol (accessed 02.08.2023)

Zoellner, J., Connell, C., Bounds, W., Crook, L., Yadrick, K. (2009). Nutrition literacy status and preferred nutrition communication channels among adults in the Lower Mississippi Delta. *Preventing Chronic Disease,* 6(4), 1-11.