

Diyabetli Bireylerde Beslenme Okuryazarlığının Yaşam Kalitesi ve Metabolik Kontrol Üzerine Etkisi

The Effect on the Quality of Life and Metabolic Control of Nutritional Literacy in Individuals with Diabetes Mellitus

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ÖZ

Amaç: Bu çalışmanın amacı diyabetli bireylerde beslenme okuryazarlığı düzeyinin yaşam kalitesi ve metabolik kontrol üzerine etkisini incelemektir.

Materyal ve Metot: Tanımlayıcı ve kesitsel tipteki bu çalışma, Türkiye'nin kuzey batısında bir şehir merkezinde faaliyet gösteren bir aile sağlığı merkezinde Kasım 2020-Nisan 2021 tarihleri arasında 423 diyabetli birey ile yapılmıştır. Veriler, "Sosyodemografik ve sağlığa ilişkin veri formu", "Yetişkinlerde beslenme okuryazarlığı değerlendirme aracı" ve "Dünya Sağlık Örgütü-Beş İyilik hali indeksi" ile toplanmıştır. Metabolik değerlendirmede Hemogloblin A1C, açlık kan şekeri, kolesterol, trigliserid, düşük dansiteli lipoprotein kolesterol, yüksek dansiteli lipoprotein kolesterol ve beden kütle indeksi sonuçları kullanılmıştır.

Bulgular: Diyabetli bireylerde, beslenme okuryazarlığı ile yaşam kalitesi ve yüksek dansiteli lipoprotein kolesterol düzeyi arasında pozitif yönlü yüksek ve anlamlı; beden kütle indeksi, hemogloblin A1C, açlık kan şekeri ve kolesterol arasında negatif yönlü yüksek ve anlamlı ilişki bulunmuştur.

Sonuç: Diyabetli bireylerde yetersiz/sınırlı beslenme okuryazarlığı düzeyi, metabolik kontrol değerlerini ve yaşam kalitesini olumsuz etkilemektedir.

Anahtar Kelimeler: Beslenme, diyabet, okuryazarlık, yaşam kalitesi

ABSTRACT

Objective: This study aims to examine the effect on the quality of life and metabolic control of nutritional literacy in individuals with diabetes.

Materials and Methods: This descriptive and cross-sectional study was conducted with 423 individuals with diabetes in a family health center operating in a city center in northwest of Turkey between November 2020 and April 2021. The data were collected using the "Socio-demographic and health-related data form", "Evaluation instrument of nutrition literacy on adults" and "The World Organization-Five Well-being index". Metabolic control was evaluated using the results of Hemogloblin A1C, fasting blood glucose, cholesterol, triglyceride, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and body mass index.

Results: It was found that there was a high and positive significant correlation between nutritional literacy with quality of life and high-density lipoprotein cholesterol, there was a high and negative significant correlation between nutritional literacy and body mass index, hemogloblin A1C, fasting blood glucose, and cholesterol of individuals with diabetes.

Conclusion: It was found that there was a high and positive significant correlation between nutritional literacy with quality of life and high-density lipoprotein cholesterol, there was a high and negative significant correlation between nutritional literacy and body mass index, hemogloblin A1C, fasting blood glucose, and cholesterol of individuals with diabetes.

Keywords: Diabetes mellitus, literacy, nutritional, quality of life

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INTRODUCTION

Diabetes mellitus (DM) is an important public health problem that develops due to increased blood glucose levels as a result of insulin deficiency, insulin resistance, or a combination of both, and may cause acute and chronic complications.¹ Effective individual follow-up is required for the control and treatment of DM and to prevent or delay the complications that may occur. The most important individual measure that patients can take and the key factor in the control of this disease are having adequate nutritional literacy.² Nutritional literacy is defined as the ability of individuals to have and apply knowledge about food, nutrients, adequate and balanced nutrition, choosing and consuming healthy food, and cooking and storing foods correctly. In other words, it is defined as the degree to which individuals can obtain, process, understand, and convey to others the necessary information to make informed decisions about nutrition.³ Nutritional knowledge and skills play an important role in choosing the right foods for individuals with DM, making their quality of life consistent with their metabolic self-management and providing metabolic control of their body mass index (BMI).^{4,5} Increasing the quality of life of individuals and keeping metabolic parameters within the appropriate limits is associated with learning about the right diet; that is, with improving nutritional literacy.⁶

As a result of a study investigating the relationship of health literacy with diabetes mechanisms, it was reported that nutritional literacy is very important in diabetes and that there is a limited number of studies examining the relationship between nutritional literacy, metabolic control, and quality of life.⁷

This study aims to help fill the gap in the literature by examining the effect of nutritional literacy on metabolic control and quality of life in individuals with DM.

MATERIALS AND METHODS

Ethics Committee Approval: In this research, ethical approval was obtained from the Human Research Ethics Commission of University (Date:09.10.2020, decision no:897), and institutional permission was received from the Provincial Directorate of Health (Date:16.11.2020–95762934-799). Informed consent was obtained from the diabetic individuals who agreed to participate in the study.

Study Setting and Selection Criteria: This descriptive and cross-sectional study was conducted with 423 individuals with diabetes in a family health center operating in a city center in northwest of Turkey between November 2020 and April 2021. The population of the study is 512 individuals with diabetes registered to the FHC. The sample of the study con-

sisted of 423 individuals with diabetes who met the inclusion criteria and volunteered to participate in the study. The inclusion criteria were: being over 18 years of age, having been diagnosed with DM for at least one year, having at least an elementary education, and having volunteered to participate in the study. The exclusion criteria were: being visually and/or hearing impaired, having any neuropsychological disease had been diagnosed.

Data Collection: The data were collected using the Socio-demographic and health-related data form, Evaluation instrument of nutrition literacy on adults (EINLA), and The World Organization-Five (WHO-5) Well-being index. Metabolic control was evaluated using the results of Hemoglobin A1C (HbA1c), fasting blood glucose (FBG), cholesterol, triglyceride, low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), and body mass index (BMI). The metabolic control evaluations of the participants were based on the blood results obtained in the last 1 month. For those without blood results, venous blood was taken to assess metabolic control. Data collection forms were filled in by the participants in FHC. The height and weight of the participants were measured for BMI calculation.

Socio-demographic and Health-Related Data Form: This form was created by the researchers by scanning the literature (3-5,7). It consists of 12 questions about age, gender, educational status, marital status, employment status, income status, health status, nutritional status, and nutritional education status. by Mearns et al

WHO-5 Well-being index: This scale, which was developed by Bech et al,⁸ was rearranged as 5 items within the scope of the project carried out by the WHO in order to measure the quality of life of patients.⁹ It consists of 5 items. Each item is evaluated between 0 and 5. 0 represents the “worst possible” and 5 represents the “best possible” quality of life. The Turkish adaptation studies of the scale and its validity and reliability studies were carried out by Eser et al.¹⁰ This scale is a means of measuring the quality of life of the participants for the last two weeks. An increase in the scores obtained from the scale indicates an increase in the quality of life.

EINLA: This scale was developed by Cesur, Koçoğlu, and Sümer as a tool for understanding and evaluating the nutritional information read by adults.¹¹ A total score of 0-11 points indicates “inadequate”, 12-23 points “limited”, and 24-35points “adequate” nutritional literacy.¹⁰ The Cronbach's Alpha reliability coefficient of the original scale was 0.75, and it was found to be 0.81 as a result of its use in our study.

Metabolic Control Data: BMI was classified using

the WHO standardization.¹¹ Recent blood results for HbA1c, FBG, cholesterol, LDL, HDL, and triglycerides were also obtained from medical records were based on the guidelines from the American Diabetes Association (ADA).¹²

Statistical Analysis: Statistical analysis of the data was performed using SPSS 22.0 (IBM Corporation, Armonk, NY, USA) package program. In data analysis, percentage, mean±SD, t-test, ANOVA, Tukey test, and Pearson Correlation Coefficient were used. Multiple regression analysis was used to determine the effects of independent variables on dependent variables. The significance level in the tests was taken as p <0.05.

RESULTS

The socio-demographic and health-related characteristics of the participants are given in Table 1. 52.2%

of the participants were male, 43.0% were between the ages of 59-69, 75.4% were married, 56.4% were employed, 62.6% had middle income, 38.8% had diabetes for 1-5 years, 59.8% had not received any education about nutrition in diabetes, and 71.6% of them requesting nutrition education in diabetes (Table 1).

The metabolic evaluations of the individuals with DM according to their level of nutritional literacy are given in Table 2. The BMI, HbA1c, FBG, cholesterol, and HDL values of those individuals with DM who had adequate nutritional literacy were statistically significantly lower than those with inadequate and limited levels.

Table 3 shows the comparison of demographic and health-related characteristics of the individuals with DM according to scale mean scores. The EINLA mean scores of those who were sex (p=0.001), age

Table 1. Some demographic and health-related characteristics of individuals with DM.

Variables	n	%	Variables	n	%
Sex			Diabetes duration		
Female	202	47.8	1-5 years	164	38.8
Male	221	52.2	6-10 years	142	33.6
Age (years)			≥ 11 years	117	27.7
37-47	104	24.6			
48-58	137	32.4	Co-morbidities		
59-69	182	43.0	Yes	189	44.7
Education status			No	234	55.3
Primary school	134	31.7	Regular breakfast		
Middle school	84	19.9	Yes	288	68.1
High school	92	21.7	No	98	23.2
University	113	26.7	Sometimes	37	8.7
Marital status			Skipping meals		
Married	319	75.4	Yes	63	14.9
Single	49	11.6	No	66	15.6
Widow	55	13.0	Sometimes	294	69.5
Working status			Nutrition education status		
No	184	43.5	Yes	170	40.2
Yes	239	56.5	No	253	59.8
Income status					
Good	124	29.3	Requesting nutrition education		
Middle	265	62.6	Yes	303	71.6
Poor	34	8.1	No	120	28.4

Table 2. Metabolic evaluation according to nutrition literacy levels of individuals with DM.

Variables	Inadequate Mean ±SD	Limited Mean ±SD	Adequate Mean ±SD	F	p
BMI (kg/m²)	29.18±10.18	25.58±10.99	20.65±8.30	13.759	0.000**
HbA1c (%)	8.63±2.61	7.52±2.03	6.98±2.66	12.203	0.001*
FBG(mg/dL)	167.28±87.12	148.52±45.19	138.56±40.15	17.170	0.000**
Cholesterol (mg/dL)	204.26±48.35	195.48±31.81	180.65±53.33	3.701	0.025*
Triglycerides (mg/dL)	175.09±102.08	165.85±112.54	163.34±86.79	4.123	0.128
HDL (mg/dL)	44.86±10.74	45.10±11.58	46.98±9.25	8.379	0.015*
LDL (mg/dL)	123.41±40.65	120.98±38.74	118.56±45.89	1.580	0.228

*p<0.05; **p<0.001; F: ANOVA; BMI: Body mass index; HbA1c: Glycated hemoglobin; FBG: Fasting blood glucose; LDL: Low-density lipoprotein cholesterol; HDL: High-density lipoprotein cholesterol; mg/dL: milligram/deciliter.

(p=0.000), education status (p=0.012), marital status (p=0.000), working and income status (p=0.000), diabetes duration (p=0.000), co-morbidities (p=0.000), regular breakfast (p=0.001), skipping meals (p=0.000) and nutrition education status (p=0.012) were found to be statistically significant. In examining the quality of life according to the socio-demographic and health-related characteristics of the individuals with DM no significance was found according to sex (p=0.781), while age (p=0.000), educational status (p=0.023), marital status (p=0.015), working status (p=0.000) and in-

come status (p=0.021), co-morbidities (p=0.000) and nutrition education status (p=0.018) were found to be statistically significant (p<0.05) (Table 3). It was determined that there was a high and significant positive correlation between the nutritional literacy and quality of life (r: 0.820; p=0.001) and the HDL (r: 0.580; p=0.003) of individuals with DM. There was a high and negative significant correlation between nutritional literacy and BMI (r:-0.698; p=0.000), HbA1c (r:-0.712; p=0.001), FBG (r:-0.690; p= 0.000) and, Cholesterol (r:-0.754; p=0.008) (Table 4).

Table 3. Comparison of socio-demographic and health-related characteristics according to scales means of individuals with DM.

Variables	EINLA		WHO-5 Well-being index	
	Mean ±SD	Statistics	Mean ±SD	Statistics
Sex				
Female	25.08±8.87	t=0.318	9.42±4.48	t=0.278
Male	21.85±7.71	p=0.001***	8.64±4.12	p=0.781
Age (years)				
37-471	29.66±3.49	F=257.42	13.25±2.56	F=90.684
48-582	25.14±5.99	p=0.000**	11.89±2.45	p=0.000**
59-693	15.17±6.15	*Difference=1>2, 1>3, 2>3	10.25±6.23	*Difference=1>3
Education status				
Primary school1	12.51±2.63	F=351.68	9.35±4.38	F=91.564
Middle school2	21.46±7.22	p=0.012***	10.52±3.59	p=0.023***
High school3	26.86±3.31	*Difference=4>3,2,1	12.45±5.63	*Difference=4>2,1
University4	29.55±4.20	3>2,1; 2>1	13.57±4.45	
Marital status				
Married1	22.96±7.87	F=75.397	14.63±3.45	F=85.658
Single2	27.18±5.47	p=0.000**	12.36±2.96	p=0.015***
Widow3	11.52±1.52	*Difference=2>1,3; 1>3	9.96±3.85	*Difference=1>3
Working status				
No	15.03±5.33	t=-22.502	8.95±4.62	t=-22.240
Yes	27.30±5.83	p=0.000**	15.56±2.85	p=0.000**
Income status				
Good1	30.66±2.78	F=256.224	13.52±2.23	F=90.479
Middle2	18.51±6.73	p=0.000**	10.36±3.69	p=0.021***
Poor3	11.54±1.31	*Difference=3>2,1; 2>1	7.63±4.35	*Difference=1>3
Diabetes duration				
1-5 years1	29.42±3.50	F=281.966	13.54±2.85	F=89.523
6-10 years2	19.55±6.63	p=0.000**	12.23±3.45	p=0.235
>11 years3	14.43±5.97	*Difference=3>2,1; 2>1	10.67±3.56	
Co-morbidities				
Yes	15.40±6.27	t=-20.881	8.12±2.56	t=-20.881
No	27.26±5.40	p=0.000**	14.45±4.25	p=0.000**
Regular breakfast				
Yes1	25.91±6.28	F=198.388	11.56±5.84	F=91.325
No2	13.41±5.67	p=0.001***	11.28±3.56	p=0.156
Sometimes3	13.89±3.38	*Difference=1>2,3	10.85±3.74	
Skipping meals				
Yes	13.98±6.71	F=86.221	11.35±4.52	F=88.564
No	30.13±3.22	p=0.000**	12.84±3.43	p=0.458
Sometimes	21.84±7.62	*Difference=2>3,1	11.97±4.62	
Nutrition education status				
Yes	24.70±7.81	t=5.787	14.39±3.94	t=-20.150
No	20.12±8.09	p=0.012***	10.75±3.63	p=0.018***

t: Independent Samples t test; F: ANOVA; *Tukey test; **: p<0.001; ***: p<0.05; EINLA: Evaluation instrument of nutrition literacy on adults.

Table 4. Correlation with metabolic control and WHO-5 Well-being index of Nutritional literacy of individuals with DM.

Variables	r	p
HbA1c (%)	-0.712**	0.001*
FBG (mg/dL)	-0.690**	0.000*
Cholesterol (mg/dL)	-0.754**	0.008*
HDL (mg/dL)	0.580**	0.003*
BMI (kg/m ²)	-0.698**	0.000*
WHO-5 Well-being index	0.820**	0.001*

Pearson correlation coefficient; *:p<0.01; **: correlation coefficient; HbA1c: Glycated hemoglobin; FBG: Fasting blood glucose; LDL: Low-density lipoprotein cholesterol; HDL: High-density lipoprotein cholesterol; BMI: Body mass index.

In the regression table constructed to explain the effect on the Well-being index, BMI, and HbA1c results of the nutritional literacy level of the individuals with DM, it was found that nutritional literacy affected the quality of life, BMI, and HbA1c. It was determined that the quality of life explained 84.7% ($R^2 = 0.847$) of the nutritional literacy level, BMI explained 48.7% ($R^2 = 0.487$), and HbA1c explained 48.6% ($R^2=0.486$) (Table 5).

DISCUSSION AND CONCLUSION

It is thought that this study will contribute to the literature as it is the first study to examine the effect of nutritional literacy on metabolic control values and quality of life in individuals with DM registered in FHC. This study examined the level of nutritional literacy of individuals with diabetes and found that they had a limited level of nutritional literacy. In one study examining the effect of nutritional literacy level on the self-care activities of individuals with diabetes, it was determined that one out of every five individuals had a limited level of nutritional literacy, similar to our study.³ The lack of any other study evaluating nutritional literacy in individuals with diabetes necessarily limits the discussion of this specific finding of the study.

In this study, it was determined that there was a statistically significant difference in the level of nutri-

tional literacy in terms of all socio-demographic characteristics except for sex. Examining other study evaluating the relationship between nutritional literacy and socio-demographic characteristics, it was determined that they had similar findings to the current study, in that there was a negative correlation with age, and a positive correlation with education level.¹³ Examining the literature in terms of the effect of sex and marital status on nutritional literacy, results were found that were similar to those of the current study.¹⁴

Nutritional literacy was also affected by the health characteristics of the individuals with diabetes.^{15,16}

In the current study, it was observed that individuals with diabetes who had a longer period of diagnosis and had a comorbid disease had lower nutritional literacy levels. In addition, it was determined that the nutritional literacy of those who did not eat breakfast regularly, skipped meals, and did not receive education about nutrition in diabetes was also found below. These findings were also supported by some studies in the literature. In these studies, it was found that the presence of a diagnosed chronic disease and an increase in the duration of diagnosis had a negative impact on nutritional literacy,¹⁷ that individuals who did not skip meals had a higher level of nutritional literacy,¹⁸ and nutrition-related education increased the level of nutritional knowledge.¹⁹

Table 5. Regression table of the effect on WHO-5 Well-being index, BMI, and HbA1c of EINLA.

Dependent variable	Independent variable	β	t	p	R^2	Adj. R^2	F
Model 1	Constant		5.893	0.00*	0.847	0.846	324.432
WHO-5 Well-being index	EINLA	0.820	48.212	0.00*			
	Constant		103.948	0.00*	0.487	0.486	399.273
BMI	EINLA	-0.698	-19.982	0.00*			
	Constant		31.176	0.00*	0.486	0.485	382.294
HbA1c(%)	EINLA	-0.712	-21.245	0.00*			

*p: 0.00; R: Regression coefficient; EINLA: Evaluation instrument of nutrition literacy on adults; BMI: Body mass index; HbA1c: Glycated hemoglobin.

There is an increasing prevalence of many diseases and their accompanying complications, especially obesity, in individuals with inadequate nutritional literacy.²⁰ In individuals with diabetes, for whom nutritional behaviors are very important, BMI values can be kept within appropriate limits by sufficient nutritional literacy. BMI may increase as a result of negative nutritional behaviors due to inadequate/limited nutritional literacy as well as medical and individual factors in individuals with diabetes.²¹ When the BMIs of the diabetic individuals who participated in this study were examined, it was seen that they were in the overweight category with a mean of 27.36 ± 3.24 , and there was a significant relationship between nutritional literacy and BMI. In similar studies investigating the relationship between nutritional literacy and BMI conducted with different sample groups, was determined that nutritional literacy significantly affected the BMI value and that the BMI of individuals who had inadequate nutritional literacy was higher.^{22,23} An increase in BMI is associated with increased complications from diseases, a more negative body image, and thus a negative effect on the quality of life.

It has been reported that approximately 86.2% of individuals with DM have poor metabolic control.²³ The relationship between metabolic parameters and nutritional literacy was also examined in the current study. It was determined that there was a significant correlation between nutritional literacy and the HbA1c, FBG, cholesterol, and HDL values, while there was no significant correlation between nutritional literacy and triglyceride and LDL values. Similar to the current study, the study conducted by Mearns et al showed that there was a significant relationship between nutritional literacy and cholesterol, HbA1c, FBG, and HDL values.²⁴ These results are similar to the findings of the current study, which indicate that nutritional literacy may have a potential impact on blood glucose and lipid values. This study also evaluated the quality of life of individuals with diabetes using the WHO-5 Well-being index. Quality of life is an important criterion for evaluating the health status and the effects of the treatment given to an individual with diabetes.²⁵ The quality of life means a score of the individuals who participated in the study was found to be 15.28 ± 2.56 and this was determined to be moderate in terms of how the scale is evaluated. Another study found that the quality of life of individuals with diabetes was similarly low.²⁶

In the current study, it was found that the individuals of a lower age, higher education level, who were married, employed, had a good income, had no comorbid disease, and had received education about nutrition in diabetes had higher quality of life scores than the others. Similarly, other studies have found

that factors such as a lower education level, lower-income level, not being married, and having a comorbid disease negatively affected the quality of life.^{27,28,29} As seen from these parameters, quality of life is affected by a wide variety of factors.

This study investigated the relationship between nutritional literacy, metabolic parameters, and quality of life: it was concluded that there was a negative correlation between nutritional literacy and metabolic values (HbA1c, FBG, cholesterol, HDL) and BMI and that there was a positive correlation between nutritional literacy and the quality of life of the individuals with diabetes. Similarly, in a study examining the effect of health literacy and nutritional status on the glycemic values of individuals with diabetes, it was found that there was a negative correlation between glycemic values and BMI and the level of nutritional knowledge.³⁰

In this study, it was observed that inadequate/limited nutritional literacy negatively affected the metabolic control values and quality of life. Accordingly, a range of educational policies should be developed to increase the nutritional literacy levels of individuals with diabetes. It is recommended that initiatives such as education, seminars, and conferences be planned, with an initial focus on primary health care institutions and an evaluation of the health and nutritional literacy of individuals who use their services.

Ethics Committee Approval: In this research, ethical approval was obtained from the Human Research Ethics Commission of University (Date:09.10.2020, decision no:897), and institutional permission was received from the Provincial Directorate of Health (Date:16.11.2020-95762934-799). Informed consent was obtained from the diabetic individuals who agreed to participate in the study.

Conflict of Interest: No conflict of interest was declared by the authors.

Author Contributions: Concept-TAG, TG; Supervision- TAG, TG; Materials- TAG, TG; Data Collection and/or Processing- TAG, TG; Analysis and/ or Interpretation- TAG, TG; Writing-TAG, TG.

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