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Cardiovascular disease risk factors knowledge of individuals with type 2 diabetes and associated factors

Tip 2 diyabetli bireylerin kardiyovasküler hastalık risk faktörleri bilgisi ve ilişkili faktörler

Fadime Gök

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Abstract

Purpose: This study aimed to determine the knowledge level of individuals with type 2 diabetes regarding cardiovascular disease risk factors and the affecting factors.

Materials and methods: This single-center, descriptive and cross-sectional study was conducted with patients (n=207) who were admitted to Pamukkale University Hospitals Health Research and Application Center Endocrine polyclinic for control between September 2021 and December 2021.

Results: The mean age of the individuals with type-2 DM who participated in the study was 60.99±13.74 years, and had been suffering from type-2 DM for a mean of 12.22±9.86 years. The mean scores of the cardiovascular diseases risk factors knowledge level scale was found to be 17.90±3.33. It was determined that 51.2% of the individuals included in the study were female, 31.9% had a history of type-2 DM and 52.2% had a history of heart disease. When their health-promoting behaviors were examined, it was determined that very few of the participants exercised but paid attention to healthy nutrition. It was determined that the cardiovascular risk factors knowledge levels of the patients did not differ statistically in terms of sociodemographic variables (p>0.05). However, it was determined that there was a statistically significant difference between some variables related to heart health-promoting behaviors such as exercise status, amount of fruit/vegetables consumed daily, preferred foods in snacks, monitoring blood sugar/cholesterol level, getting an ECG and having cardiovascular health checked (p<0.05).

Conclusion: The cardiovascular disease risk factors knowledge levels of the patients participating in the study were below the mean score of the scale. Although their level of knowledge was not very low, the ratio of the healthy lifestyle behaviors they developed to the general risk factors knowledge level was found to be quite low. Individuals with type-2 DM who have preventive health behaviors and exhibit positive eating habits have higher knowledge levels than others.

Keywords: Type-2 diabetes, cardiovascular disease, risk factors, health behaviors, level of knowledge.

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Öz

Amaç: Bu çalışmada, Tip 2 diyabetli bireylerin kardiyovasküler hastalıklar risk faktörleri bilgi düzeyleri ve etkileyen faktörlerin belirlemesi amaçlandı.

Gereç ve yöntem: Tek merkezli, tanımlayıcı ve kesitsel tipteki bu çalışma Eylül-Aralık 2021 tarihleri arasında Pamukkale Üniversitesi Hastaneleri Sağlık Araştırma Uygulama Merkez Müdürlüğü Endokrin polikliniğine kontrol amacı ile gelen hastalarda (n=207) yürütüldü.

Bulgular: Tip 2 diyabetli bireylerin yaş ortalaması 60,99±13,74 yaş olup, ortalama 12,22±9,86 yıldır diyabet hastasıdır. Kardiyovasküler hastalıklar risk faktörleri bilgi düzeyi ölçeği toplam puan ortalamaları 17,90±3,33 olarak bulundu. Araştırma kapsamına alınan bireylerin %51,2'sinin kadın, %31,9'unun DM öyküsü ve %52,2'sinin kalp hastalığı öyküsü olduğu belirlendi. Sağlığı koruyucu davranışları incelendiğinde çok azının eğersiz yaptığı fakat sağlıklı beslenmeye özen gösterdikleri tespit edildi.

Hastaların kardiyovasküler risk faktörleri bilgi düzeyi açısından sosyodemografik değişkenler arasında istatistiksel olarak anlamlı fark saptanmadı (p>0,05). Fakat kalp sağlığı koruyucu davranışlarına ait bazı değişkenler arasında (egzersiz yapma durumu, günlük tüketilen mevye/sebze miktarı, ara öğünlerde tercih edilen besinler, kan şekeri/kolesterol düzeyini takip etme, EKG çektirme ve kalp damar sağlığını kontrol ettirme durumu) istatistiksel olarak anlamlı farklılık olduğu belirlendi (p<0,05).

Sonuç: Çalışmaya alınan hastaların kardiyovasküler hastalık risk faktörleri bilgi düzeyleri ölçek puan ortalamasının altındaydı. Bilgi düzeyleri çok düşük olmamakla birlikte geliştirdikleri sağlıklı yaşam biçimi davranışlarının genel risk faktörleri bilgi düzeyine oranı oldukça düşük bulundu. Koruyucu sağlık davranışına sahip ve olumlu beslenme alışkanlığı sergileyen Tip-2 DM'li bireylerin bilgi düzeyleri diğerlerine göre daha yüksektir.

Anahtar kelimeler: Tip 2 diyabet, kardiyovasküler hastalık, risk faktörleri, sağlık davranışları, bilgi düzeyi.

Gök F. Tip 2 diyabetli bireylerin kardiyovasküler hastalık risk faktörleri bilgisi ve ilişkili faktörler. Pam Tıp Derg 2022;15:824-834.

Fadime Gök, Ass. Prof. Surgical Nursing Department, Faculty of Health Sciences, Pamukkale University, 20020, Denizli, Turkey, e-mail: fadimgok@gmail.com (https://orcid.org/0000-0003-0415-4229) (Corresponding Author)

Introduction

Type-2 diabetes (T2DM) is a chronic disease characterized by high blood glucose levels and abnormalities in carbohydrate, fat, and protein metabolism. According to the International Diabetes Federation's (IDF) 2021 data, 537 million people in the world have diabetes and 90% of them are diagnosed with type-2 DM [1]. Chronic hyperlipidemia in individuals with DM affects circulatory physiology, causing cardiovascular diseases (CVD) [2-5]. CVD is a significant cause of morbidity/mortality in individuals with diabetes and it is difficult to examine the risk factors separately from DM [6, 7]. According to the American Diabetes Association (ADA) report (2019) and the Turkish Endocrinology and Metabolism Society Guidelines (2020), controlling risk factors in individuals with DM also reduces the risk of CVD [8, 9]. ADA [4] data also supports this information.

There are modifiable and non-modifiable risk factors in the development of DM and CVD. Modifiable risk factors such as malnutrition, obesity, and sedentary life play a role in the development of both DM and CVD [10]. The most effective way to reduce risk is to control modifiable risk factors [4, 11, 12]. Khot et al. [13] also emphasize that CVD-related morbidity and mortality can be reduced by 80-90% by controlling modifiable risk factors. Therefore, the level of knowledge about CVD risk factors of individuals with type-2 DM should be increased and healthy living behaviors should be established [14-17]. In the literature, it has been stated that reducing alcohol/cigarette use, regular exercise, and a plant-based diet reduce the risk of type-2 DM and CVD [18]. It is reported that similar results have been found in different studies conducted in this field in Turkey as well as in the world [2, 19-21]. However, type-2 DM and the complications it causes still remain important. Therefore, this study aimed to examine the knowledge level of individuals with type-2 DM regarding CVD risk factors and the affecting factors.

Research questions

• What is the knowledge level of individuals with type-2 DM on cardiovascular disease risk factors?

• What affects the knowledge level of individuals with type-2 DM on cardiovascular disease risk factors?

• Do individuals with type-2 DM exhibit healthy lifestyle behaviors?

• Is there a relationship between the knowledge level of cardiovascular disease risk factors and healthy lifestyle behaviors of individuals with type-2 DM?

Materials and methods

Study type and ethical approval

The population of this single-center, descriptive and cross-sectional study consisted of type-2 DM individuals (n=2615) who applied to Pamukkale University Hospitals Health Research and Application Center Endocrine outpatient clinic between September 2021 and December 2021. Those who are over 18 years old, diagnosed with type-2 DM at least six months ago, have no history of heart failure or coronary artery disease (CAD), have no malignant or chronic liver disease, can speak and understand Turkish, have no communication barriers, have mental competence, who was conscious and willing to participate in the study were included in the study.

T-test was used in independent groups in the "G.Power-3.1.9.4" software to determine the sample size by statistical power analysis [22]. Accordingly, it was found that a minimum of 172 people should be included in the sample, by taking the medium effect size (0.50) as a reference in determining the sample size, accepting the alpha bidirectional Type I error value as 0.05 and the power as 0.90. Two hundred fifty-seven (257) people were reached considering the data losses. A total of 50 individuals who did not meet the inclusion criteria were excluded from the study. Therefore, 207 people formed the sample of the study. Data were collected based on self-report. Volunteers were included in the study. So, the records of those who did not accept the study were not kept. The random sampling method, one of the non-probability sampling methods, was used as the sampling method.

To conduct the research, a written permit was obtained from the Board of Ethics of Pamukkale University Medical Faculty, the hospital where the research was carried out, the authors who developed the scale, and individuals participating in the study. The study

was conducted in accordance with the principles of the Declaration of Helsinki.

Patients and data collection

Data were collected by face-to-face interview technique using the "Individual Descriptive Information Form" and the "Cardiovascular Diseases Risk Factors Knowledge Level (CARRF-KL) Scale".

Individual Descriptive Information Form: Prepared using the relevant literature [2, 23, 24]. There are 33 (thirty-three) questions in the questionnaire form regarding socio-demographic characteristics, cardiovascular risk factors, and protective behaviors for heart health.

Cardiovascular Diseases Risk Factors Knowledge Level (CARRF-KL) Scale: It was developed by Arikan et al. [24], and its validity and reliability study was conducted. The scale questions the characteristics of cardiovascular diseases, their preventability, risk factors, and the result of changes in risk behaviors. There are 28 items on the scale. The score that can be obtained from the scale is between 0-28.

No cut-off point is given on the scale. As the scores increase, the level of knowledge increases. The mean score of the scale was found to be 19.3±3.2, the median value was 19.0 and the score distribution was between 5-27 points. The scale mean score is calculated in the sample group where the application is made. Participants who score above the calculated mean score are considered to have a high level of knowledge, and those who score below the mean score are considered to have a low level of knowledge. The internal consistency coefficient of the scale (Cronbach alpha) is 0.768 [24]. In this study, the Cronbach alpha coefficient of the scale was found to be 0.827.

Statistical analysis

Data analysis was performed with the IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA) package program. Descriptive data were expressed as numbers and percentages. Analyzes of CVD risk factors knowledge levels were given with mean and standard deviation. The distribution normality analysis was calculated according to the kurtosis and skewness analysis. According to this calculation, variables in the range of skewness= 0, and kurtosis= ±2 were accepted as normal distributions [25]. Since the data were homogeneous, t-test and one-way analysis of variance were used to compare the cardiovascular disease risk factors knowledge levels of the participants according to their sociodemographic/cardiovascular risk factors and protective behaviors. The Posthoc Bonferroni test was used to determine where the statistical difference detected in the one-way analysis of variance originated. The correlation size between the significant analyses was analyzed by linear regression analysis. The significance level for all tests was accepted as $p<0.05$.

Results

The mean age of the individuals with type-2 DM who participated in the study was 60.99±13.74 years and had diabetes for a mean of 12.22±9.86 years. It was determined that 51.2% of the participants were female, 83.6% were married, 60.4% were primary school graduates, 41.5% were overweight, 70% had a medium income, 46.9% lived with their spouse, 48.8% have social insurance, and 35.7% of them were housewives. When the family history of the patients was examined, it was determined that 31.9% had a history of type-2 DM, 52.2% had a history of heart disease and 52.2% had a history of hypertension. It was determined that 21.3% of the patients had one of the complications of type-2 DM, and neuropathy and diabetic foot were the most common (5.3%) (Table 1). When the health-promoting behaviors of individuals with type-2 DM were examined, it was determined that 22.7% of the participants smoke, 13.0% use alcohol, 34.8% exercise, 29.5% of those who exercise walk, 14.5% do these exercises at least three times a week, 35.3% consume at least one fruit per day, 43.0% consume at least one portion of vegetables per day, 44.9% consume fish at least once a week, 30.0% do not consume any salt, 59.9% prefer healthy foods as snacks, 55.1% consumed healthy fats, 65.2% had cardiovascular health checked regularly, 50.2% had regular ECG taken, 69.1% had regular blood sugar control, 65.2% had blood cholesterol level control, 55.6% controlled arterial blood pressure, 64.3% preferred elevator when climbing stairs (Table 2).

The mean score of the CARRF-KL scale of the individuals participating in the study was 17.90±3.33 points (Table 1). A statistically

Table 1. Characteristics of individuals with type-2 DM

Variables		Mean	SD
Age [a]		60.99	13.74
Diagnosis of DM (years) [a]		12.22	9.86
BMI [a]		28.15	4.92
CARRF-KL Scale [a]		17.90	3.33
		n	**%**
Gender[b]	Female	106	51.2
	Male	101	48.8
Maritalstatus[b]	Married	173	83.6
	Single	34	16.4
Educational status[b]	Primary Education	125	60.4
	Secondary Education	25	12.1
	High School	30	14.5
	Graduate	27	13.0
Body mass index group	Normal weight (BMI Between 18.5 and 24.9)	49	23.7
	Excess weight (BMI Between 25 and 29.9)	86	41.5
	Obese (BMI Between 30 and 39.9)	72	34.8
Economic situation[b]	Bad	26	12.6
	Average	145	70.0
	Good	36	17.4
Person living with[b]	Alone	22	10.6
	Spouse	97	46.9
	Kids	29	14.0
	Spouse and Kids	59	28.5
Social security[b]	SSI	101	48.8
	Pension Fund	56	27.1
	Bağkur (Social security organization for artisans and the self-employed)	36	17.4
	Private insurance	5	2.4
	None	9	4.3
Profession[b]	Officer	19	9.2
	Employee	17	8.2
	Self-employment	14	6.8
	Housewife	74	35.7
	Retired	63	30.4
	Farmer	11	5.3
	Student	4	1.9
	Unemployed	5	2.4
Having a history of DM in family[b]	Yes	66	31.9
	No	141	68.1
Having a history of heart disease in family[b]	Yes	108	52.2
	No	99	47.8
Having a history of hypertension in family[b]	Yes	108	52.2
	No	99	47.8
Having any of the complications of DM[b]	Yes	44	21.3
	No	163	78.7

Table 1. Characteristics of individuals with type-2 DM

Variables		Mean	SD
Type of complication (n=44)[b]	Neuropathy +Diabetic foot	11	5.3
	Neuropathy	10	4.8
	Retinopathy	10	4.8
	CAD+MI*	7	3.4
	Nephropathy	6	2.9

CAD: Coronary Artery Disease, *MI: Myocardial Infarction

[a]Values were analyzed with mean ± Standard deviation

[b]Values were analyzed with number and percentage

Table 2. Results on protective health behaviors of heart health of individuals with type-2 DM

Variables		n	%
Smoking status	Yes	47	22.7
	No	108	52.2
	Quit	52	25.1
Alcohol use status	Yes	27	13.0
	No	132	63.8
	Quit	48	23.2
Status of exercising	Yes	72	34.8
	No	135	65.2
Type of exercising (n=72)	Walking	61	29.5
	Arm and leg exercise	3	1.4
	Aerobic	3	1.4
	Fitness	2	1.0
	Swimming and cycling	3	1.4
How many times do you exercise per week? (n=72)	Once or twice	22	10.6
	Three or four times	30	14.5
	Five or six times	20	9.7
Amount of fruit consumed in a day (Pieces)	None	37	17.9
	One	73	35.3
	2-3	65	31.4
	4-5	32	15.5
The amount of vegetables consumed in a day (Portion)	None	31	15.0
	One	89	43.0
	2-3	87	42.0
Do you consume fish at least once a week?	Yes	93	44.9
	No	114	55.1
Salt consume status	I never use salt	62	30.0
	Using less salt	82	39.6
	Using an average amount of salt	63	30.4
Foods preferred for snacks	Healthy (fruit, yogurt, nuts)	124	59.9
	Unhealthy (Chips, Coke, Biscuit, Cookies etc.)	83	40.1
Oil consumption status	Healthy (olive oil and butter)	114	55.1
	Unhealthy (vegetable oil or margarine)	93	44.9
Checking cardiovascular health	Yes	135	65.2
	No	72	34.8
Checking ECG	Yes	104	50.2
	No	103	49.8

Table 2. Results on protective health behaviors of heart health of individuals with type-2 DM

Variables		n	%
Checking blood sugar	Yes	143	69.1
	No	38	18.4
	Occasionally/sometimes	26	12.6
Checking blood cholesterol	Yes	135	65.2
	No	72	34.8
Checking arterial blood presure	Yes	115	55.6
	No	57	27.5
	Occasionally/sometimes	35	16.9
Stair climbing preference	On food	74	35.7
	Elevator	133	64.3

significant difference was found between the CVD risk factors knowledge level of individuals with type-2 DM and exercising (p=0.029), amount of fruit consumed per day (p=0.022), vegetables consumed per day (p=0.001), type of food preferred for snacks (p=0.025). regular blood glucose monitoring (p=0.030), blood cholesterol level monitoring (p=0.001), ECG (0.022), and cardiovascular health checks (p=0.007). In the posthoc (Bonferroni) analysis to determine the group that makes the difference in the amount of fruit/vegetables consumed daily and blood sugar monitoring, it was determined that the difference in daily fruit consumption was caused by the difference between those who said none and 4-5, the difference in vegetable consumption was caused by the difference between those who say none and 2-3 portions, and the difference in blood glucose monitoring was caused by the difference between those who said never and those who said occasional/sometimes. Individuals who consumed 4-5 fruits and 2-3 portions of vegetables per day and had occasional/sometimes blood glucose measurements had higher cardiovascular disease risk factors knowledge levels (Table 3). Except for the sociodemographic characteristics of the individuals with type-2 DM and the data above, no statistically significant difference was found between the protective behaviors of heart health and the cardiovascular risk factors knowledge levels (p>0.05).

The relation between the variables related to health-protective behaviors affecting the CVD risk factors knowledge level of the individuals participating in the study was evaluated by backward multivariate linear regression analysis, and is given in Table 4. CVD risk factors knowledge level of individuals with type-2 DM who had their blood cholesterol level checked, (B:0.249, 95% CI:0.839-2.627, p<0.001), who consumed 4-5 servings of vegetables per day (B:0.226, 95% CI:0.460-1.669, p=0.001), who prefer to consume healthy food for snacks (B:0.147, 95% CI:0.131-1.862, p=0.024) was found to be higher than the others individuals.

Discussion

In this study, which was conducted to determine the cardiovascular diseases risk factors knowledge levels of individuals with type-2 DM and influencing factors, it was determined that the CVD risk factors knowledge level mean score of the participants (17.90±3.33) was below the original scale mean score (19.30±3.2) [24]. The knowledge levels of individuals about CVD risk factors are not very low. However, the ratio of the healthy lifestyle behaviors they have developed to the level of general risk factors knowledge is quite low.

Studies are reporting that individuals with type-2 DM have different levels of CVD risk factor knowledge (low/moderate or high) [6, 12, 26, 27]. Taskin Yilmaz et al. [6] examined the relationship between CVD risk and healthy lifestyle behaviors in individuals with type-2 DM and found the CARRF-KL score above the mean score of the scale (19.35). In addition, Bozdemir Ozel et al. [27] examined cardiovascular disease risk factors knowledge level and physical activity levels of individuals with type-2 DM and found CARRF-KL score to be higher than the original scale mean score (20.69±3.86).

Contrary to these findings, there are studies in which CVD risk factors knowledge level mean score of the individuals with type-2 DM was found to be low. Andsoy et al. [26] found the CVD knowledge level mean score of the participants to be 19.18±4.46, while Kayaniyil

Table 3. Distribution of cardiovascular disease risk factors knowledge level mean scores according to heart-protective behaviors of individuals with type-2 DM (n=207)

Variables		n	CARRF-KL X ± SD		*p*
Exercising	Yes	72	18.59	3.15	t=2.197 *p*=.029
	No	135	17.54	3.36	
	None	37	17.16	3.35	
Amount of fruit consumed in a day (pieces)	1	73	17.61	3.27	F=3.296 *p*=.022
	2-3	65	17.89	3.55	
	4-5	32	19.46	2.22	
The amount of vegetables consumed in a day (portion)	None	31	16.45	3.17	F=7.127 *p*=.001
	1	89	17.64	3.56	
	2-3	87	18.70	2.84	
Preferred foods for snacks	Healthy	124	18.33	3.32	t=2.255 *p*=.025
	Unhealthy	83	17.27	3.24	
Blood sugar monitoring	Yes	143	17.95	3.23	F=.580 *p*=.030
	No	38	16.89	3.74	
	Occasionally/sometimes	26	19.11	2.79	
Checking cardiovascular health	Yes	135	18.36	3.02	t=2.735 *p*=.007
	No	72	17.05	3.69	
Monitoring blood cholesterol level	Yes	135	18.56	3.02	t=4.018 *p*=.001
	No	72	16.68	3.59	
Having ECG	Yes	104	18.43	3.28	t=2.303 *p*=.022
	No	103	17.37	3.29	
Smoking status	Yes	47	17.21	3.38	F=2.882 *p*=.058
	No	108	17.79	3.35	
	Quit	52	18.76	3.09	
Alcohol use status	Yes	27	17.29	3.64	F=1.268 *p*=.284
	No	132	17.81	3.30	
	Quit	48	18.50	3.18	
Salt consumption status	I never use salt	62	18.33	3.34	F=. 943 *p*=.391
	Using less salt	82	17.87	3.48	
	Using an average amount of salt	63	17.52	3.08	
Oil consumption status	Healthy (olive oil and butter)	114	18.00	3.43	t=-.358 *p*=.721
	Unhealthy (vegetable oil or margarine)	93	17.83	3.20	

et al. [12] found it to be 16.67±2.59. Similarly, in this study, the mean CVD knowledge level of individuals with type-2 DM was below the mean score of the original scale (17.90±3.33). The reason for this may be that the education level of the majority of the individuals participating in the study was a primary school. In the CARRF-KL scale validity and reliability study and another study conducted in different sample groups, patients with high CARRF-KL mean scores were patients with high education levels [6, 24, 27]. Bozdemir Ozel et al. [27] stated that most of the participants had a high school or higher education level as the reason for finding the

Table 4. Variables affecting cardiovascular disease risk factors knowledge level of individuals with type-2 DM*

Variables	B	%95 GA	*p*
Monitoring of blood cholesterol level status			
Yes	0.249	0.839-2.627	<0.001
No	-		
The amount of vegetables consumed in a day (Portion)			
1-3	-		
4-5	0.226	0.460-1.669	0.001
Preferred foods for snacks			
Healthy	0.147	0.131-1.862	0.024
Unhealthy	-		
R^2=0.135			

*Variables of affecting CVD risk factors were analyzed using the backward multivariate linear regression analysis method. Model Adjusted R^2=0.135. Exercising status, amount of fruit consumed per day (pieces), amount of vegetables consumed per day (portion), food preferred in snacks, ECG status, blood sugar monitoring, blood cholesterol level monitoring, cardiovascular health control status were included in the model.

CVD risk factors knowledge level mean score to be higher than the original scale mean score. Similarly, in a study by Kayaniyil et al. [12] in Canada, it was reported that the CVD risk factor knowledge level of the patients was moderate, but the educated patients were more willing to get more information and create healthy lifestyle behaviors. Similar to the present study, Wagner et al. [28], found that patients had a low level of knowledge about CVD risk factors. The most important factor causing low levels of knowledge was shown to be the low level of education of the patients included in the study. Therefore, it is emphasized that the level of knowledge is important in reducing CVD risk factors in individuals with type-2 DM. Studies show that as individuals' knowledge of cardiovascular disease risk factors increases, their rates of healthy lifestyle behaviors also increase [24, 27, 28]. This situation is interpreted as a high level of education contributing to an increase in the level of knowledge, and a high level of knowledge contributes positively to the development of healthy lifestyle behaviors. It is not possible to examine CVD risk factors separately from type-2 DM [4-7].

Controlling risk factors in individuals with DM also ensures that the risk of CVD is also controlled [8-12]. It was emphasized in the literature that in controlling type-2 DM and CVD risk factors, it is much more important to control modifiable risk factors such as smoking/alcohol use, obesity, malnutrition, and sedentary life, as well as non-modifiable factors such as advanced age and genetic factors [2, 6, 7, 12, 13, 28-32]. In particular, reducing smoking/alcohol use, practicing regular physical exercise, and developing healthy lifestyle behaviors such as positive eating habits have been shown to reduce CVD risk factors by lowering HbA1C, lipid, and blood pressure levels [6, 18, 19, 31-33].

However, studies show that the majority of individuals with type-2 DM smoke and consume alcohol, are obese, and have low levels of physical activity [2, 6, 29, 31].

In this study, similar to the literature, it was determined that the average age of type-2 DM individuals is advanced, most of them lead a sedentary life (do not exercise, prefer elevators instead of stairs) and most of them are overweight. However, contrary to the literature, it was found that very few of them are smokers, and very few of them use alcohol, moreover, most of them had healthy eating habits, especially snacks, paying attention to the consumption of healthy food. Most of the individuals in the study group have no family history of type-2 DM. However, they have a history of CVD and hypertension in the family. The study findings show that most of the participants have more than one of the modifiable and non-modifiable CVD risk factors.

Today, the increase in mortality rates due to cardiovascular diseases has revealed the need to take urgent measures against risk factors [34]. The fact that individuals do not have sufficient knowledge about CVD risk factors causes difficulties in the prevention and management

of the disease [35]. This requirement becomes much more essential for individuals with type-2 DM. Type-2 DM causes macrovascular (coronary artery disease, peripheral vascular disease, hypertension, cerebrovascular event) and microvascular (retinopathy, nephropathy, neuropathy) complications in the long term [2, 3, 5, 14, 20, 21]. The most significant complication that reduces the quality of life and seriously threatens life is cardiovascular disease [3, 20].

It was stated in the literature that most of type-2 DM patients with an average disease duration of 10 years or more develop any of the chronic complications of type-2 DM. Complications were determined in 71.5% of the participants in the study of Gur et al. [2], in 57% of individuals with type-2 DM in the study of Kara and Cinar [36], and 49.0% of the patients in the study of Taskin Yilmaz et al. [6]. Contrary to the literature, although the individuals included in this study had been suffering from type-2 DM for a mean of 12.22±9.86 years, complications were detected in very few of them (21.3%). The reason for this can be considered as the fact that most of the patients included in the study have fulfilled many of the heart-health promoting behaviors (quitting smoking and alcohol use, having blood sugar/blood cholesterol level monitoring, ECG taking, etc.) and have developed a positive eating habit (none of them consume too much salt, most of them consume healthy fats, consume enough fruits and vegetables, prefer healthy foods in snacks, etc.). These individuals have higher levels of knowledge of CVD risk factors.

In this study, it was determined that the CVD risk factors knowledge levels of individuals with type-2 DM who develop health-promoting behaviors (exercise, have blood sugar/blood cholesterol level monitoring, have regular ECG and heart health checks) and exhibit positive eating habits (consume 4-5 fruits/2-3 portions of vegetables a day, prefers to consume healthy food in between meals) higher than other individuals. The difference between them was statistically significant.

However, in the regression analysis, it was seen that only a few of these variables affected the level of knowledge. It has been observed that regular blood cholesterol control and choosing healthy food for snacks have an increasing effect on the total score of the scale. In addition, the increase in vegetable consumption has an increasing effect on the total score of the scale. This situation can be interpreted as having a positive healthy lifestyle behavior increases the CVD risk factors knowledge level of the person. On the other hand, it can be also thought that a high level of knowledge can be effective in creating a healthy lifestyle behavior. In this study, no statistically significant relationship was found between the CVD risk factors knowledge level of individuals with type-2 DM, except for any variable other than 'blood cholesterol level monitoring' from health-promoting behaviors and 'daily amount of vegetables consumed' from positive eating habits. This situation can be interpreted as having healthy lifestyle behaviors may have an increasing effect on the knowledge level of the person. To reduce the risk of CVD in individuals with type-2 DM, it is essential to increase the level of knowledge of these individuals and convert this knowledge into behaviors. In the literature, there are studies reporting a relationship between creating healthy lifestyle behaviors and CVD risk factors knowledge level, as in this study [6, 18, 19, 30, 31-33]. Studies have reported that the development of other complications of type-2 DM, especially CVD, can be prevented by lifestyle changes [6, 24, 27, 28].

This study has several limitations. Firstly, limitation of the study is that only patients admitted to a tertiary hospital were included. Another limitation is the use of nonprobabilistic sampling method and the majority of the participants are primary school graduates. Therefore, the generalizability of the results of the study is low. In addition, exercise status, smoking and alcohol use status, and body mass index were measured by non-objective questioning. Also, since this study is a cross-sectional study, the causality of the relationships revealed is not certain.

As a result, although the cardiovascular disease risk factors knowledge levels of the patients included in the study were below the scale average, they were not very low. However, the ratio of the healthy lifestyle behaviors they developed to the general risk factors knowledge level is low. It has been observed that protective health behaviors and having positive eating habits have an increasing effect on the total score of the scale. The CVD risk factors knowledge level of individuals who have their blood cholesterol level checked, consume enough vegetables and prefer healthy foods for snacks is higher than the others. It is important

to develop healthy lifestyle behaviors against cardiovascular diseases in individuals with type-2 DM. For this reason, it is recommended that these individuals be encouraged to create healthy lifestyle behaviors.

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