Koşuyolu Heart Journal

Koşuyolu Heart J 2025;28(1):18–25
DOI: 10.51645/khj.2025.480

Original Article

Examination of Diabetes Awareness Levels in Patients with Type II Diabetes

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Abstract

Objectives: : This study was conducted to determine the level of diabetes awareness in patients with type 2 diabetes and to examine the individual and disease characteristics that affect it.

Methods: In the descriptive study, data were collected from patients who applied to the internal medicine outpatient clinic of a private branch state hospital, which was selected according to the purposive sampling method. The data were collected from 252 type 2 diabetes patients whose population was calculated according to the known sample calculation formula, who met the inclusion criteria and agreed to participate in the study. Individual and disease characteristic questionnaire consisting of 25 questions and type 2 diabetes knowledge/awareness level questionnaire were used to collect the data. Percentage, analysis of variance, and post hoc tests were used in the statistical analysis of the data.

Results: The mean age of the individuals participating in the study was 68 ± 5, 48.4% of them were between 50 and 79 years of age, 52.4% were male, 41.64% were illiterate, 21% had low income, It was determined that 31.7% of them had diabetes for less than a year, 34.7% had a hemoglobin A1C value higher than 8, and 25.3% had been using insulin for 6–9 years. It was found that 38.5% of the participants had no awareness of type 2 diabetes. Significant differences were found between type 2 diabetes knowledge/awareness questionnaire level mean scores and gender, age, income status, educational status, body mass index, daily physical activity, smoking, and disease characteristics.

Conclusion: It was found that 38.5% of the participants with type 2 diabetes were not aware of type 2 diabetes. Diabetes awareness levels were found to be higher among women, university graduates, those who are thin, those who do physical activity, those who do not smoke, those who have chronic diabetes complications, those who received diabetes education in the last year, and those who have diabetes mellitus for <1 year. Therefore, when diabetes is diagnosed, it is recommended to initiate and maintain effective, regular, and continuous health education programs and to monitor the education results.

Keywords: Awareness; diabetes mellitus; knowledge.

This article is a master's thesis study of Okan University Institute of Health Sciences, Public Health Nursing field (2022).

It was presented as an oral presentation at the 7th International 18th National Nursing Congress (23-25 September 2022, Konya, Türkiye).

Cite This Article: Karasakal B, Ekici E. Examination of Diabetes Awareness Levels in Patients with Type II Diabetes. Koşuyolu Heart J 2025;28(1):18–25

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Submitted: October 01, 2024
Revised: January 24, 2025
Accepted: February 25, 2025
Available Online: April 02, 2025

Tip II Diyabetli Hastalarda Diyabet Farkındalık Düzeylerinin İncelenmesi

Özet

Amaç: Bu çalışma, Tip 2 diyabetli hastalarda diyabet farkındalık düzeyinin belirlenmesi ve bunu etkileyen bireysel ve hastalık özelliklerinin incelenmesi amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı tipteki araştırmada, amaçlı örnekleme yöntemine göre seçilen, özel dal bir devlet hastanesinin dahiliye polikliniğine başvuran hastalardan veriler toplanmıştır. Veriler, evreni bilinen örnek hesaplama formülüne göre hesaplanan, dahil edilme kriterlerini karşılayan ve çalışmaya katılmayı kabul eden 252 Tip 2 diyabet hastasından toplanmıştır. Verilerin toplanmasında, 25 sorudan oluşan bireysel ve hastalık özellikleri anketi ve Tip 2 Diyabet Bilgi/Farkındalık Düzeyi Anketi kullanılmıştır. Verilerin istatistiksel analizinde yüzdelik, varyans analizi ve post hoc testler kullanılmıştır.

Bulgular: Araştırmaya katılan bireylerin yaş ortalamasının 68 ± 5 olduğu, %48,4'ünün 50-79 yaş aralığında olduğu, %52,4'ünün erkek olduğu, %41,64'ünün okuma yazma bilmediği, %21'inin düşük gelirli olduğu, %31,7'sinin bir yıldan az süredir diyabet hastası olduğu, %34,7'sinin HgA1c değerinin 8'in üzerinde olduğu ve %25,3'ünün 6-9 yıldır insülin kullandığı belirlendi. Katılımcıların %38,5'inin Tip 2 diyabet konusunda farkındalığının olmadığı belirlendi. Tip 2 diyabet Bilgi/Farkındalık Anketi düzeyi puan ortalamaları ile cinsiyet, yaş, gelir durumu, eğitim durumu, vücut kitle indeksi, günlük fiziksel aktivite, sigara içme ve hastalık özellikleri arasında anlamlı farklılıklar bulunmuştur.

Sonuç: Tip 2 diyabetli katılımcıların %38,5'inin Tip 2 diyabet farkındalığı olmadığı belirlendi. Kadınlarda, üniversite mezunu olanlarda, zayıf olanlarda, fiziksel aktivite yapanlarda, sigara içmeyenlerde, kronik diyabet komplikasyonu yaşayanlarda, son yıl içinde diyabet eğitimi alanlarda, bir yıldan az süredir şeker hastalığı olan kişilerde ve kadınlarda diyabet farkındalık düzeylerinin daha yüksek olduğu belirlendi. Bu nedenle diyabet tanısı konulduğunda etkili, düzenli ve sürekli sağlık eğitim programlarının başlatılması, sürdürülmesi ve eğitim sonuçlarının izlenmesi önerilmektedir.

Anahtar sözcükler: Farkındalık; tip 2 diyabet; bilgi.

Introduction

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin or the body cannot effectively use the insulin it produces. Type 2 diabetes (previously called non- insulin-dependent or adult-onset) is caused by the body's ineffective use of insulin.[1] More than 95% of people with diabetes have type 2 diabetes. This type of diabetes is largely the result of excess body weight and physical inactivity. [2] The prevalence of diabetes is increasing rapidly in the world and in our country due to changing lifestyles, increasing population, prolonged life expectancy, unhealthy diet, and insufficient physical activity.[3] In 2021, the global prevalence of diabetes among people aged 20–79 years was estimated to be 10.5% (536.6 million people) and is projected to increase to 12.2% (783.2 million) in 2045. Turkey has the highest prevalence of diabetes in the IDF European region, with 11.1% of the population affected. It ranks third in the region, after Germany and Russia, with 6.6 million adults living with diabetes. It is also estimated that Turkey will be one of the ten countries with the highest number of people with diabetes in 2045.[4] The results of the Turkish Diabetes, Obesity, and Hypertension Epidemiology Study (TURDEP II) indicate that the prevalence of diabetes in the Turkish adult population is 13.7%.[5] The delay in the treatment of diabetes can lead to microvascular and macrovascular complications due to chronic hyperglycemia over time (TURDEP II). However, it has been demonstrated that elevated blood glucose levels in individuals with diabetes can augment the risk of blood clots by stimulating the blood coagulation system.[1,6] In these patients, life-threatening problems are seen, especially when there is delay in intervening in acute symptoms such as hypo/hyperglycemia.[1] In a large cross-sectional study conducted in Denmark, it was found that 35% of 6958 previously undiagnosed participants had complications at the time of diagnosis, of which 12% had microvascular complications, 17% had macrovascular complications, and 6% had both micro- and macrovascular complications.[7] Patients who fail to follow-up and care for diabetes regularly experience various organ and functional failure problems after many years. 1 out of every 2 people is unaware that they have diabetes. This ignorance and lack of awareness lead to an increase in diabetes complications and thus deterioration in the quality of life of individuals with diabetes.[4] There is a close link between diabetes and cardiovascular disease. Cardiovascular disease is the most common cause of mortality and morbidity in diabetic populations.[6,8] Lifestyle measures have been shown to be effective in preventing or delaying the onset of type 2 diabetes.[9,10] To prevent type 2 diabetes and its complications, the World Health Organization recommends achieving and maintaining a healthy weight, moderate intensity physical activity for at least 30 min a day, including more for weight control, a healthy diet free of sugar and saturated fat, and not smoking to prevent the risk of cardiovascular disease.[2] In this context, prevention of short- and long-term complications of diabetes can be achieved through diabetes awareness and effective diabetes self-management.[11,12] It is known that more than 37 million people in the USA have diabetes and 1 in 5 of them do not know that they have diabetes and 8 out of 10 people with prediabetes are not aware of their condition.[13] In our country, Dinççağ et al.[14] conducted a study with adults to determine diabetes and obesity awareness and found that 69.9% of the participants had low and insufficient diabetes awareness. In a diabetes awareness study conducted with 3977 volunteers aged 60 years and older in Malaysia, the effect of age, gender, income status, lifestyle characteristics, family history of disease, and ethnicity on the prevalence of diabetes was evaluated. Accordingly, the risk and complications of diabetes were found to be higher in those with Indian ethnic origin, those with low income and those who did not perform adequate physical activity.[15] In a study conducted to determine and compare the level of awareness about diabetes complications and diabetes management in 561 men and women with diabetes in Peshawar, Pakistan, the general awareness levels of both men (63.7%) and women (87%) were found to be low, and it was found that the awareness of female patients was relatively lower.[16] In a study conducted in our country, the prevalence of diabetes was determined as 21% and diabetes awareness was determined as 66.3%. It was determined that the prevalence of diabetes was related to age, presence of chronic disease, obesity, and overweight, and while the awareness of diabetes was 76.6% in individuals aged 60 and over, this rate was 53.8% in young people.[17] According to the Turkish Diabetes Prevention and Control Program, the rate of diabetes awareness in patients with diabetes was shown to be 32%.[3] In the study conducted by Atmaca et al.,[18] it was reported that since diabetes is a preventable and controllable disease, the rate of increase of the disease and all risk factors and complications that may occur due to the disease can be reduced by providing diabetes awareness by providing correct education about the disease. In our country, there are a limited number of studies evaluating diabe-

tes awareness in patients with type 2 diabetes.[3,18] In this study, diabetes awareness of type 2 diabetes patients and the factors affecting it will be examined. It is thought that the results of this study will be important in terms of providing descriptive data to health personnel working with diabetic patients. It is thought to contribute to diabetes education programs to be prepared.

Materials and Methods

Population and Sample of the Study

The descriptive study was conducted with patients who applied to the internal medicine outpatient clinic of a state hospital providing health services affiliated with the Ministry of Health between May 2021 and August 2021. The hospital where the study will be conducted was selected according to the purposive sampling method. The sample size was calculated using the sample calculation formula with known population. According to the data obtained from the Information Processing Center of the hospital, 758 patients diagnosed with diabetes applied to the internal medicine outpatient clinics in 2020. Accordingly, when the number of individuals in the universe is taken as 758, the response distribution is 50%, the margin of error is 0.05 and the confidence interval is 95%, the sample size is calculated as 252 people according to the known sample size formula.

Data Collection Forms of the Study

The research data were obtained with individual and disease characteristics questionnaire and type 2 diabetes mellitus (DM) knowledge/awareness level questionnaire. Individual and disease characteristics questionnaire: It consists of 22 questions including age, gender, height, weight, smoking, alcohol use, and disease characteristics.

Type 2 DM knowledge/awareness level questionnaire: It was created by Dinççağ et al.[14] and used in the study of diabetes and obesity awareness in Turkey. Permission was obtained from Dinççağ for the use of this form. The questionnaire consists of 25 questions including information about type 2 diabetes and each correct answer is evaluated as 1 point. Those who answered no to five questions (20, 21, 35, 36, and 42) and yes to the other questions are considered to have answered the questions correctly and correct answers are evaluated as "1" point and a total score is calculated. Classification of participants according to DM knowledge score is as follows:

- Those with 10 points or less have no awareness
- Those who score between 11 and 15 are those who are aware
- Those with scores between 16 and 25 are grouped as those with high awareness (Dinççağ et al,[14]. In this study, Cronbach's alpha level was found to be 0.89.

Statistical Analysis

The data obtained within the scope of the research were analyzed with the Statistical Package for the Social Sciences 24 program. Within the scope of the research, frequency and percentage analysis from descriptive analysis was used to give the distribution of the participants according to their sociodemographic characteristics. As a result of the normal distribution of the data obtained, hypothesis tests were statistically tested at 95% confidence level and t-test in independent samples was used to examine the differences of the scores obtained from the scales according to groups of 2, Scheffe and one-way analysis of variance (ANOVA) analysis and one-way ANOVA analysis from post hoc tests were used to determine the differences between groups of more than 2.

Inclusion Criteria

Patients who agreed to participate in the study, had no communication barriers, could understand and answer the questions, and had type 2 diabetes were excluded. Patients with intellectual and pervasive developmental disorders who were not able to respond verbally were excluded.

Ethical Aspects of the Research

The participants were assured that the data collected as a result of the study would not be used in any way other than scientific studies and that their identity information would not be taken. Before starting the study, permission was obtained from the from Okan University Research Ethics Committee (February 17, 2021, number: 133). After the ethics committee permission was obtained, institutional permission dated April 02, 2021, and numbered 53838792-604.01.01.01-01-2834 was obtained from the provincial health directorate to which the hospital where the study was conducted. This study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Variables of the Study

Dependent Variables: Level of knowledge/awareness about type 2 DM independent variables: Individual and disease characteristics of participants.

Results

The distribution of participants according to sociodemographic characteristics is shown in Table 1. 52.4% of the participants were male and 47.6% were female. It was found that 48.4% of the participants were between the ages of 50–79 and the mean

Table 1. Distribution of sociodemographic characteristics of the participants (n=252)

Demographic	Group	n	%
Gender	Male	132	52.4
	Woman	120	47.6
Age groups	20–49	79	31.3
	50–79	122	48.4
	80 and above	51	20.3
Education status	Illiterate	105	41.64
	Primary School	90	35.71
	High School	45	17.85
	University	12	4.76
Income status	Low	53	21.0
	Middle	139	55.2
	High	60	23.8
Average age, (mean±SD)		68±5	

SD: Standard deviation.

Table 2. Distribution of individual characteristics of the participants (n=252)

Features	Subgroup	n	%
	18.5 and below weak	30	12.87
Body mass index (kg/m^2)	18.5–24.9 normal	75	29.81
	25–29.5 overweight	105	41.75
	30 and over obese	40	15.57
	Yes	142	56.34
Smoking status	No	110	43.66
Alcohol use status	Yes	37	14.7
	No	215	85.3
Physical activity status	Yes	166	65.9
	No	86	34.1
	0 min	86	34.1
Duration of physical	0–30 min	53	21.0
activity (per day)	30–60 min	83	32.9
	60 min and over	30	11.0

age was 68 ± 5 years. It was determined that 41.64% of the participants were illiterate, 35.71% were primary school graduates, 21% had low income, and 55.2% had medium income.

The distribution of participants according to their individual characteristics is shown in Table 2. It was found that 41.5% of the participants were overweight and 15.57% were obese. It was determined that 56.34% of the individuals smoked cigarettes and 14.7% used alcohol. It was determined that 34.1% of the participants did not allocate time for physical activity and 32.9% did physical activity for 30–60 min a day. When the distribution of the participants according to their disease characteristics was analyzed, it was found that 31.5% of the participants had diabetes for <1 year. It was determined that 34.7% of the participants had a hemoglobin A1C (HgA1c) value higher than 8, 17.8% did not use insulin, and 19.4% had been hospitalized for diabetes in the last year. It was determined that 47.2% of the participants received diabetes education in the last 1 year, while 52.8% did not receive this education. It was found that 44.0% of the participants did not have diabetes in their family, 47.6% had diabetes in their first-degree relatives, and 8.3% had diabetes in their second-degree relatives.

The distribution of the mean scores of type 2 DM knowledge/awareness levels of the participants is shown in Table 3. It was determined that 38.5% of the participants had no awareness of type 2 diabetes, 34.12% had awareness, and 27.38% had high awareness of type 2 diabetes.

Table 4 shows the type 2 DM knowledge/awareness levels of the participants according to their sociodemographic and individual characteristics. When type 2 DM knowledge/awareness levels were analyzed according to gender, a significant difference was found. It was found that the mean score of type 2 diabetes knowledge/awareness levels of women was significantly higher ($p<0.05$). A significant difference was found when type 2 DM knowledge/awareness levels were examined according to age. Accordingly, it was found that the mean score of type 2 diabetes knowledge/awareness level of the 20–49 age group was significantly higher than the patients aged 80 years and over ($p<0.05$). When type 2 DM knowledge/awareness levels were analyzed according to educational status, a significant difference was found.

Table 3. Distribution of type 2 DM knowledge/awareness levels of participants (n=252)

Type 2 diabetes awareness status	n	Mean±SD	%
No awareness of type 2 diabetes	97	8.3±3.23	38.5
There is awareness of type 2 diabetes	86	13.2±2.2	34.12
Awareness of type 2 diabetes is high	96	19.5±3.5	27.38

DM: Diabetes mellitus; SD: Standard deviation.

It was found that the mean score of type 2 diabetes knowledge/awareness level of university graduates ($p=0.005$) was significantly higher than illiterates ($p<0.05$). When type 2 DM knowledge/awareness levels were analyzed according to income status, a significant difference was found. Mean score of type 2 It was found that the diabetes knowledge/awareness level of those with high income was significantly higher than those with low income ($p<0.05$). A significant difference was found when type 2 DM knowledge/awareness levels were examined according to body mass index (BMI). It was found that the mean score of type 2 diabetes knowledge/awareness level of patients who were underweight (BMI: Below 18.5) was significantly higher than those who were obese (BMI: Above 30) ($p<0.05$). A significant difference was found when type 2 DM knowledge/awareness levels were examined according to physical activity status. It was found that the mean score of type 2 diabetes knowledge/awareness level of those who did physical activity was significantly higher than those who did not do physical activity ($p<0.05$).

It was found that the mean scores of type 2 DM knowledge/awareness scores showed statistical significance according to smoking status ($p<0.05$). It was found that the mean score of type 2 DM knowledge/awareness levels of non-smokers) was higher than that of smokers. No significant difference was found when type 2 DM knowledge/awareness was analyzed according to alcohol use status ($p=0.952$, $p>0.05$). Table 5 shows the distribution of the mean scores of type 2 DM knowledge/awareness level according to the disease characteristics of the participants. It was found that the mean score of type 2 DM knowledge/awareness level (=20.76; $p=0.024$) of those without chronic complications was significantly higher ($p<0.05$). It was found that the mean scores of type 2 DM knowledge/awareness level were statistically significant according to the status of receiving diabetes education in the last year ($t=2.245$; $p=0.000$; $p<0.05$). The mean scores of type 2 DM knowledge/awareness level of those who received diabetes education in the last 1 year) were higher than those who did not receive diabetes education in the last year. When the mean scores of type 2 DM knowledge/awareness levels were analyzed according to the presence of other diabetes patients in the family, it was found that the mean score of type 2 diabetes knowledge/awareness level of those who had other diabetes patients in their family was significantly higher ($p<0.05$). When the mean scores of type 2 DM knowledge/awareness levels were analyzed according to the presence of a concomitant disease, it was found that the mean score of type 2 DM knowledge/awareness levels of those with a concomitant disease (was significantly higher ($p<0.05$). When the mean scores of type 2 DM knowledge/awareness levels according to HgA1c value were analyzed, it was found that the mean

Table 4. Distribution of mean scores of type 2 DM knowledge/awareness levels according to individual and sociodemographic characteristics of participants (n=252)

Type 2 Diabetes awareness status	n	$\bar{X}$	SD	t	df	p
Body mass index (kg/m^2)	30	21.12	4.52			
Index (kg/m^2)						
Normal	75	18.01	4.72	F: 2.481		[a]0.036
Overweight	105	16.21	3.65			
Obese	40	15.85	3.74			
Gender						
Female	120	19.40	5.40	1.252	250	[b]0.012*
Male	132	18.36	5.62			
Age						
20–49 years	49	19.20	5.89	F:1.254		[a]0.022*
50–79 years	156	17.52	4.56			
80 and above	51	15.42	4.66			
Education status						
Illiterate	105	14.56	5.56	F:2.368		[a]0.005*
Primary School	90	18.45	4.87			
High School	45	20.94	4.26			
University	12	22.89	3.24			
Income status						
Low	119	15.51	5.25	F:4.257		[a]0.032*
Middle	89	17.21	5.54			
High	53	19.83	5.62			
Cigarette using						
Yes	142	17.65	5.50	2.874	250	[b]0.021*
No	110	20.25	5.38			
Alcohol using						
Yes	37	19.03	4.77	0.060	250	[b]0.952
No	215	18.97	5.68			
Physics activity status						
Yes	166	20.44	5.89	2.786	250	[b]0.022*
No	86	18.01	4.66			

*: p<0.05; [a]: One-way analysis of variance test; [b]: Student t test. $\bar{X}$: Mean; SD: Standard deviation; t: test value; df: Degrees of fredom.

Table 5. Distribution of the mean scores of type 2 DM knowledge/awareness level according to the disease characteristics of the participants (n=252)

Features	Subgroup	n	$\bar{X}$	SD	t	df	p
Chronic complication	Yes	126	20.76	4.58	2.538	250	[b]0.024*
	No	126	18.19	6.28			
In the last year	Yes	133	20.35	6.20	2.245	250	[b]0.000*
Receiving diabetes education	No	119	17.44	4.48			
Other in the family	Yes	142	19.37	5.67	2.254	250	[b]0.032*
Having diabetes	No	110	18.78	5.45			
An accompanying	Yes	168	16.01	5.48	2.153	250	[b]0.001*
Disease status	No	84	12.96	4.41			
HgA1c value	Less than 6.9	187	18.32	5.22	F:12.684		[a]0.012*
	6.9–8	48	12.01	4.14			
	More than 8	17	8.35	3.75			
Diabetes duration of illness	Less than 1 year	128	18.61	6.06	F:6.763		[a]0.000*
	1–5 years	68	13.88	5.51			
	6–14 years	31	8.10	3.85			
	Over 15 years	25	6.72	4.59			
Insulin using duration	Does not use	104	20.03	5.66	2.554	250	[b]0.011
	Less than 10 years	148	18.24	5.36			

*: p<0.05; [a]: One-way analysis of variance test; [b]: Student t-test. DM: Diabetes mellitus.

score of type 2 DM knowledge/awareness levels of patients with HgA1C value<6.9 was significantly higher (p<0.05). When type 2 DM knowledge/awareness levels were analyzed according to the duration of diabetes disease, it was found that the mean score of type 2 diabetes knowledge/awareness level of those with a disease duration of <1 year was significantly higher (p<0.05). It was

Table 6. Distribution of mean scores of type 2 DM knowledge/awareness level according to treatment modalities (n=252)

Scale	Treatment of diabetes	n	Mean	SD	F	p	Scheffe
Diabetes knowledge and awareness Scale	Diet therapy(1)	77	21.01	4.68			
	OAD(2)	109	19.28	4.40			(3–1)
	OAD and insulin(3)	66	16.09	6.89	**16.011**	**0.000***	(3–2)

*: p<0.001; (1): Diet terapy; (2): Oral antidiabetic; (3): Oral antidiabetic and insulin. DM: Diabetes mellitus; SD: Standard deviation; F: Anova value.

found that the mean score of type 2 DM knowledge/awareness levels differed significantly according to the duration of insulin use (t=2.554; p=0.011; p<0.05). It was found that the mean score of type 2 DM knowledge/awareness levels of non-insulin users was significantly higher than those who had been using insulin for <1 year (p<0.05). The distribution of the mean scores of type 2 DM knowledge/awareness level according to treatment modalities is shown in Table 6. A statistically significant difference was found between the mean scores of type 2 DM knowledge/awareness levels according to diabetes treatment types (F=16.011; p=0.000; p<0.05). The mean scores of type 2 DM knowledge/awareness levels of oral antidiabetic and insulin users were lower than those of diet therapy users (and OAD users (Table 6).

Discussion

The present study was conducted with the objective of ascertaining the diabetes awareness levels in patients with type 2 diabetes and examining the characteristics of both the individual and the disease that may have an effect. The results of the study indicated that 38.5% of the participants were not aware of type 2 diabetes. The analysis revealed that diabetes awareness levels were higher among certain demographic groups, including women, individuals with a university education, those with a lower BMI, those engaged in physical activity, non-smokers, individuals with chronic diabetes complications, those who received diabetes education in the previous year, and those with a diabetes duration of <1 year.

It was determined that 38.5% of the participants were not aware of type 2 diabetes (Table 1). In the TURDEP-I study, it was found that approximately 32% of individuals with diabetes in Turkey were unaware of their disease, whereas in the TURDEP-II study, which was repeated in the same centers in 2010, it was found that diabetes awareness in the community decreased and almost half of the diabetics (44.5%) did not know that they had diabetes before.[5] Atmaca et al.[18] also found that the level of awareness and knowledge of patients with diabetes was not sufficient. Studies conducted in both developed and developing countries have reported that diabetes knowledge and awareness in patients with diabetes are generally insufficient.[15,19–23] However, it is difficult to compare our results with similar studies because the studies used different tools and/or were conducted among different ethnic or age groups. Today, despite the advances in access to healthcare services and increased opportunities for diagnosis, treatment, and care, it is thought-provoking that there are more individuals with diabetes who are not aware of their diabetes. Similar to the literature, these results showed that the adoption of diabetes risk reduction and diabetes awareness behaviors is insufficient It was found that the mean score of type 2 diabetes knowledge/awareness levels of women was higher than that of men. In a study conducted to determine the level of awareness about diabetes complications and diabetes management in 561 men and women with diabetes in Peshawar, Pakistan, the general awareness levels of both men (63.7%) and women (87%) were found to be low. Unlike our study, awareness of female patients was found to be lower.[16] It was thought that the difference in our study might be due to cultural characteristics.

In our study, it was found that the mean score of type 2 diabetes knowledge/awareness level of the 20–49 age group was significantly higher than the individuals aged 80 years and over (p<0.05). In a study conducted by Almalki et al.[22] with 264 type 2 diabetes patients, the mean age of diabetics with good knowledge about their disease was 49 years (p<0.05) compared to those with insufficient knowledge. This suggests that different approaches should be adopted in diabetes education of elderly diabetic patients.

It was found that the mean score of type 2 DM knowledge/awareness level of patients with low income was lower than that of patients with medium and high income (p<0.05). In the Canadian health measures study, the frequency of diagnosed diabetes, undetected diabetes, and prediabetes and their distribution according to sociodemographic and lifestyle factors were investigated, and accordingly, it was found that diabetes diagnosis was more common in individuals with lower-middle income level compared to the highest income level.[24] It was thought that income status positively affected the individual's access to quality health services and thus diabetes awareness.

It was found that the mean score of type 2 diabetes knowledge/awareness level of university graduates was significantly higher than illiterates (p<0.05). Similar to this study, in a study evaluating the knowledge, attitudes, and practices of diabetes patients in the United Arab Emirates, the diabetes knowledge, attitudes, and practices of illiterates were found to be low similar to this study.[25] This situation suggested that patients with diabetes could not receive diabetes self-management education appropriate for their education level.

It was found that the mean score of type 2 DM knowledge/awareness levels of non-smokers was higher than that of smokers (p<0.05). In a study conducted in Kuwait, it was found that participants who were older, had lower education levels, had limited income, had a negative family history, and smoked had lower diabetes knowledge levels.[19] It was thought that health

perceptions of patients with negative health behaviors such as smoking may affect their awareness of diabetes.

It was found that the mean scores of type 2 DM knowledge/awareness scores did not show statistical significance according to alcohol use status (p>0.05). In the study conducted by,[26] it was found that there was a statistically significant difference in diabetes knowledge levels according to alcohol use status (p=0.010).

The mean type 2 DM knowledge/awareness scores of those who practiced physical activity were found to be higher than those who did not practice physical activity (p<0.05). In a study conducted by Erdoğan and Coşansu to determine the diabetes risk awareness of individuals in a metropolitan area, the diabetes risk awareness of those who did not do physical activity was also found to be higher.[27] It was thought that this may be due to the health perceptions of the patients.

It was found that the type 2 DM knowledge/awareness score of those without chronic complications was significantly higher (p<0.05). In a study conducted in Saudi Arabia with type 2 diabetes patients over the age of 18, it was found that most of the patients with low income and education levels also had low awareness of diabetes complications.[22] In a study conducted with 237 participants with type 2 diabetes, 88.2% of the participants were aware that diabetes can affect the eyes, and 81% were aware that diabetic retinopathy can lead to blindness.

It was also found that patients' high level of awareness of diabetic retinopathy was associated with a high level of education. [28] It was thought that the low level of diabetes awareness in diabetic patients with chronic complications may be related to economic status and educational status.

The type 2 DM diabetes knowledge/awareness score of those who received diabetes education in the last year was higher than those who did not receive education in the last year (p<0.05) In a systematic review aiming to determine the factors affecting the effectiveness and success of diabetes self-management education programs, it was found that this education positively affected medication compliance, self-management behavior, knowledge, self-efficacy, health beliefs, and quality of life[29] The fact that the diabetes knowledge and awareness scores of those who received diabetes education in the last year were high suggested that self- management education given to diabetes patients in the early period was successful.

When the level of knowledge/awareness of type 2 DM was analyzed according to the presence of another concomitant disease, it was found that those with a second disease had higher diabetes awareness (p<0.05). In the study conducted by Aydoğan et al.,[26] no statistically significant difference was found between the presence of concomitant chronic diseases and diabetes knowledge levels. In our study, it was thought that having an additional disease positively affected sensitivity to diabetes. When the mean scores of type 2 DM knowledge/awareness levels were analyzed according to HgA1c value, it was found that the mean score of type 2 DM knowledge/awareness levels of patients with HgA1C value<6.9 ($\bar{X}$=18.32; p=0.012) was significantly higher (p<0.05). In our study, only 38.4% of the patients had HbA1C values of 6.9 and below and 34.7% had HbA1c values above 8. In a study, it was found that 44.3% of type 2 diabetes patients did not know what HbA1c was.[22] In another study, it was found that diabetes awareness of the patients increased after self-management training and the training decreased the HbA1C level.[30] In our study, the low diabetes knowledge and awareness scores of those with high HgA1C values suggested that they could not receive effective diabetes self-management education.

It was found that the mean score of type 2 diabetes knowledge/awareness level was significantly higher in those who had other diabetes patients in their family (p<0.05). In a study similar to this study, it was found that if there was a family history of diabetes, there was a higher level of awareness among other members of that family.[31] An individual's compulsory lifestyle change cannot be considered independent from family life. For this reason, it is thought that family support will regulate the individual's relationship with diabetes and facilitate his/her adaptation to the disease, which he/she will accept as a part of his/her life. It was found that the mean score of type 2 diabetes knowledge/awareness level of those with a duration of diabetes disease of <1 year was significantly higher (p<0.05). In the study conducted by Aydoğan et al.,[26] unlike our study, it was found that individuals with a disease duration of <5 years had statistically significantly lower diabetes knowledge levels compared to individuals with a disease duration of 10–14 years and individuals with a disease duration of ≥15 years. In our study, it was thought that the higher awareness of those with a duration of diabetes disease of <1 year may be due to diabetes education received in the early period and sample characteristics.

Generalizability and Limitations of the Study

The study is limited to the responses given by diabetes patients who came to the internal medicine outpatient clinic of the training and research hospital where the study was conducted. The fact that the study was conducted in a single center and the decrease in the number of patients coming to the internal medicine outpatient clinic during the pandemic/outbreak period caused the data collection process to be prolonged.

Conclusion

It was determined that 38.5% of the participants with diabetes had no awareness of type 2 diabetes. Significant differences were found between the mean scores of type 2 diabetes knowledge/awareness level and gender, age, income, educational status, BMI, daily physical activity, smoking, and disease characteristics. Diabetes awareness levels were found to be higher in women, university graduates, those who were underweight, those who engaged in physical activity, non-smokers, those with chronic complications, those who received diabetes education in the last year, and those with a duration of diabetes of <1 year. Accordingly, as soon as diabetes patients are diagnosed, their awareness should be assessed and effective diabetes education programs should be initiated. It is recommended that further research should be conducted to investigate why educational programs given to diabetes patients do not create awareness.

Disclosures

Ethics Committee Approval: The study was approved by the Okan University Ethics Committee (no: 133, date: 17/02/2021).

Authorship Contributions: Concept – E.E., B.K.; Design – E.E.; Supervision – E.E., B.K.; Funding – B.K.; Data collection and/or processing – B.K.; Data analysis and/or interpretation – E.E., B.K.; Literature search – E.E., B.K.; Writing – E.E., B.K.; Critical review – E.E.

Conflict of Interest: All authors declared no conflict of interest.

Use of AI for Writing Assistance: No AI technologies utilized.

Financial Disclosure: The authors declared that this study received no financial support.

Peer-review: Externally peer-reviewed.

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