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THE RELATIONSHIP BETWEEN HYPOGLYCEMIC CONFIDENCE AND HYPOGLYCEMIA FEAR IN TYPE 2 DIABETES MELLITUS PATIENTS

TİP 2 DİYABETES MELLİTUSLU HASTALARIN HİPOGLİSEMİK GÜVENLERİ VE HİPOGLİSEMİ KORKULARI ARASINDAKİ İLİŞKİ

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ABSTRACT

Objective: This study aims to identify the relationship between hypoglycemic confidence and hypoglycemia fear in type 2 diabetes mellitus patients.

Method: Designed as a descriptive and cross-sectional study, this research was conducted with 306 type 2 diabetes patients who visited the diabetes polyclinic to have an examination in period December 2021 and February 2022. The research data were collected by using the "Patient Identification Form", the "Hypoglycemic Confidence Scale", and the "Hypoglycemia Fear Survey". Descriptive statistics, the Independent Samples t-test, the One-Way ANOWA test, the Pearson's correlation test, and the linear regression analysis were used in the evaluation of research data.

Results: In the research, 60.8% of the participant type 2 diabetes patients were female, their mean age was 55.14±8.10 years, and their mean duration of having the disease was 10.35±4.77 years. Means of type 2 diabetes patients' Hypoglycemic Confidence Scale (HCS)' score 1.65±0.47 and 'Hypoglycemia Fear Survey (HFS)' scores were 3.02±0.56 points. Type 2 diabetes patients' HCS scores had moderately negative relationships with scores obtained by them from the HFS and its Behavior Sub-scale and Worry Sub-scale (p<0.05).

Conclusion: It was found that type 2 diabetes patients had low-level hypoglycemic confidence and high-level hypoglycemia fear, and as hypoglycemia fear levels increased, hypoglycemic confidence levels decreased. To enhance type 2 diabetes patients' hypoglycemic confidence feelings and reduce their hypoglycemia fears, planning appropriate medical interventions and providing training and consultancy services are recommended.

Key Words: Type 2 Diabetes Mellitus, Hypoglycemia, Fear

ÖZ

Amaç: Bu çalışmanın amacı, tip 2 diabetes mellituslu hastaların hipoglisemik güvenleri ve hipoglisemi korkuları arasındaki ilişkiyi belirlemektir.

Yöntem: Tanımlayıcı ve kesitsel olarak tasarlanan bu araştırma, Aralık 2021 ve Şubat 2022 tarihleri arasında diyabet polikliniğine muayene olmak için gelen 306 tip 2 diyabetli hasta ile tamamlandı. Veriler, "Hasta Tanıtım Formu", "Hipoglisemik Güven Ölçeği (HGÖ)" ve "Hipoglisemi Korku Ölçeği (HKÖ)" kullanılarak elde edildi. Verilerin değerlendirilmesinde, tanımlayıcı istatistikler, Independent-Samples t testi, One-Way ANOVA testi, Pearson Korelasyon ve Linear Regresyon analizi kullanıldı.

Bulgular: Araştırmaya katılan Tip 2 diyabetli hastaların %60.8'i kadın olup yaş ortalaması 55.14±8.10 ve hastalık yılı ortalaması 10.35±4.77 idi. Tip 2 diyabetli hastaların HGÖ puan ortalamasının 1.65±0.47 ve HKÖ puan ortalamasının 3.02±0.56 olduğu belirlendi. HGÖ toplam puanı ile HKÖ toplam, HKÖ Davranış ve Kaygı alt boyutu arasında orta derecede negatif yönlü bir ilişki olduğu saptandı (p<0.05).

Sonuç: Tip 2 diyabetli hastaların hipoglisemik güven düzeylerinin düşük ve hipoglisemi korku düzeylerinin yüksek olduğu; hipoglisemi korkusu arttıkça güven düzeylerinin azaldığı saptanmıştır. Tip 2 diyabetli bireylerin hipoglisemiye yönelik güven duygularının artırılmasına ve hipoglisemi korkularının azaltılmasına yönelik uygun tıbbi girişimlerin planlanması, eğitim ve danışmanlık hizmeti verilmesi önerilmektedir.

Anahtar Kelimeler: Tip 2 Diyabetes Mellitus, Hipoglisemi, Korku

INTRODUCTION

Today, for reasons such as the population increase, aging, urbanization, increasing obesity, and physical immobility, the prevalence rate of Diabetes Mellitus increases just as in the case of several chronic diseases [1]. Diabetes, the prevalence rate of which increases both across the world and in Turkey, has numerous complications. One of the most frequently observed and most feared acute complications is hypoglycemia for diabetic individuals [2,3].

Hypoglycemia is the condition in which blood glucose level drops below 50 mg/dL and which has autonomic (hunger, dizziness, perspiration, palpitation, nervousness, and so on) and neuroglycopenic symptoms (headache, weakness, fatigue, seizure, coma, and so on) [1,3]. In parallel to the fall in blood glucose level, the severity of observed symptoms also changes.
Hypoglycemia can cause patients to lose consciousness, go into a coma, and even die [2,4].

In a study performed in Canada, the rate of patients having severe hypoglycemia was found as 41.8% [5]. In a study conducted in Turkey by Emral et al. (2018), it was identified that 74% of the type 1 diabetes patients and 53.6% of the type 2 diabetes patients had hypoglycemia [6].

Considering the life-threatening character of hypoglycemia and emotional, social, and behavioral consequences and challenges introduced by hypoglycemia to the individual's life, it is discerned that this complication is quite disturbing [2,5]. It is put forward that diabetes mellitus patients felt hypoglycemia fear due to symptoms exhibited in association with hypoglycemia, and even if they had adequate knowledge about diabetes care, they performed behaviors to raise the blood glucose level [1,6].

Hypoglycemia fear is viewed as the most significant factor making adaptation to treatment difficult in diabetes patients having intensive insulin therapy. Diabetes patients experiencing severe hypoglycemia have numerous fears such as failing to be aware of having hypoglycemia, having hypoglycemia when alone, having dizziness, exhibiting embarrassing behaviors, fainting in a crowded setting, having giddiness, making mistakes, having hypoglycemia while driving, causing accidents, having hypoglycemia while sleeping, and having hypoglycemia during a long-lasting activity [3,7]. In this parallel, studies focus on intervention efforts to reduce fear, such as training, cognitive behavioral therapy, and the constant follow-up of the blood glucose level [2-6].

A new concept that is focused on in the area of hypoglycemia in the relevant literature is hypoglycemic confidence. Hypoglycemic confidence means that diabetic individuals feel confident and comfortable about their hypoglycemia-related problems. This new concept points to the importance of paying attention not only to the patient's negative attitude (fear, and so on) but also to the patient's positive attitude (confidence, and so on) [5-8]. The concept of hypoglycemic confidence is a person's personal power and feeling of comfort arising from the belief that the person has the necessary resources to be protected from hypoglycemia-related problems. At the same time, it represents the positive side of the state of hypoglycemia fear and avoidance [4,6].

Numerous research studies performed about diabetes and other health problems indicated that self-confidence in personal knowledge and/or abilities was likely to have a significant effect on self-care behaviors and clinical outcomes [3,7,8]. In the study by Polonsky et al. (2017), it was identified that patients had high-level hypoglycemic confidence, patients using insulin managed to have better glycemic control, and there was a relationship between hypoglycemic confidence and glycemic control. In the same study, it was also stated that hypoglycemic confidence played a role independent of the hypoglycemia fear [8].

In light of the above points, it is considered that the identification of hypoglycemic confidence and hypoglycemia fear levels is of importance, firstly, to the effective management of hypoglycemia that is one of the complications affecting the quality of diabetic individuals' lives, secondly, to the adaptation of diabetic individuals to treatment, and thirdly, to the prevention of chronic complications developing over time in association with diabetes mellitus [2,4,7]. Thus, this study will guide the way for, first, the categorization of circumstances in which diabetic individuals felt/did not feel confident in terms of the hypoglycemia management and had hypoglycemia fear, second, the identification of areas in which diabetic individuals needed to be strengthened, and third, the development of interventions, training programs, and consultancy services by health professionals [3,8].

This study aims to identify the relationship between type 2 diabetes mellitus patients' hypoglycemic confidence and hypoglycemia fear levels.

Research Questions

-What are type 2 diabetes mellitus patients' hypoglycemic confidence and hypoglycemia fear levels?

-Do type 2 diabetes mellitus patients' sociodemographic and disease-related characteristics affect their hypoglycemic confidence and hypoglycemia fear levels?

-Is there any relationship between type 2 diabetes mellitus patients' hypoglycemic confidence and hypoglycemia fear levels?

METHOD

Research Design and Population

This research was designed as a descriptive and cross-sectional study. The research was conducted with patients who visited the Endocrine/Diabetes Polyclinic of Turgut Özal Medical Center of Malatya Turgut Özel University of Turkey in period between December 2021 and February 2022. In the context of the power analysis conducted with 0.3 effect size, 95% power, and 5% type 1 error, the sample size was calculated as 301 participants. The research was completed with a total of 306 type 2 diabetes patients.

The inclusion criteria of the study comprised the following:

- during the research period due to being diagnosed with type 2 diabetes mellitus,
- being aged 18 years or above,
- having insulin therapy for a minimum of one year,
- having hypoglycemia at least once,
- having no neurological and mental problem,
- having no audiovisual disorder, spoke Turkish,
- agreeing to participate in this study.

Instruments

The "Patient Identification Form", the "Hypoglycemic Confidence Scale", and the "Hypoglycemia Fear Survey" were used in the data collection process.

The Patient Identification Form: That was created by researchers in light of the review of the relevant literature had 23 questions about patients' descriptive characteristics [2-7].

Hypoglycemic Confidence Scale (HCS): William Polonsky et al. developed the HCS in 2017 [8], and Büyükkaya Besen and Dervişoğlu performed the validity and reliability study in Turkish for the HCS [9]. HCS items are scored from 1 point to 4 points (1 – I am not confident at all, 2 – I am a little confident, 3 – I am moderately confident, 4 – I am very confident). The ninth HCS item created for the diabetic individual who had a spouse/partner was rated as follows: 1 – He/she is not confident at all, 2 – He/she is a little confident, 3 – He/she is moderately confident, 4 – He/she is very confident. The sum of points obtained by a diabetic individual from HCS items is divided by the number of HCS items, and hence, the diabetic individual's total HCS score is obtained (The calculation of the total HCS score for diabetic individuals without a spouse is based on points obtained solely from eight items). The HCS has no sub-scale, and the increase in the score obtained by a diabetic individual from the HCS shows that the diabetic individual's confidence level increased. The HCS has no cut-off point [8,9]. Cronbach's alpha coefficient was 0.86 for the HCS [9]. In the current study, Cronbach's alpha coefficient was identified as 0.93 for the HCS.

Hypoglycemia Fear Survey (HFS): Cox et al. (1987) developed the HFS to identify diabetic individuals' hypoglycemia fear levels [10]. The HFS is comprised of two sub-scales, Behavior and Worry, and has a total of 32 items. The Behavior Sub-scale is composed of 15 items in total. In this part, diabetic individuals answer questions designed to find out what they did in their daily lives in the last six months to prevent their blood glucose levels from dropping.

The Worry Sub-scale is comprised of 17 items, and in this part, diabetic individuals answer questions developed to explore how often they felt worried about substances given to them in the last six months as a response to the fall in their blood glucose levels. Answers are scored from 0 to 4 points (0 – never, 1 point – rarely, 2 points – sometimes, 3 points – often, 4 points – always). A high score obtained by a diabetic individual from the HFS shows that the diabetic individual has high-level hypoglycemia fear [10,11]. Cronbach's alpha coefficient was found as 0.90 for the HFS in the validity and reliability study performed in Turkish by Erol and Enç [11]. In the current study, Cronbach's alpha coefficient was calculated as 0.91 for the HFS.

Data Collection

The data collection form was filled out by researchers in the recreation room in December 2021 and February 2022 via face-to-face interviews held with type 2 diabetes mellitus patients who agreed to participate in the study. Patients were informed about the research aim, its duration, and format and were told that participation in the research was voluntary, and next, they were asked to state that they consented to participate in the study. Filling out the form took approximately 8-10 minutes.

Statictical Analysis

In the study, the data were analyzed with the Statistical Package for Social Science (SPSS) 24.0 package program. (SPSS) Data distribution was evaluated using the Kolmogorov-Smirnov test. Cronbach's alpha coefficient was calculated for reliability. Independent samples t-test was used to compare two independent groups, and one-way analysis of variance (ANOVA) was used for those with more than two. Bonferroni test was used to determine the difference between significant groups. Pearson correlation was used for correlation analysis and linear regression analysis was used to analyze predictors of Hypoglycemic confidence. In the study, the p value was accepted as below 0.05.

Ethical Approval

The ethical endorsement for the research was obtained from the Health Sciences Non-Invasive Clinical Research Ethics Committee of İnönü University of Turkey (Date: 02.12.2021, Decision number: 2021-27/8). Also, the written permission to conduct the research was received from Turgut Özal Medical Center of the Faculty of Medicine of Malatya Turgut Özal University (No.89656013-103). Moreover, patients were informed that their data would not be shared with any third party, they were free to participate in the research, and could withdraw from the research any time they desired, and next, they were asked to state in written format that they consented to participate in the study. Additionally, permission to use the above measurement instruments in the study was received from their developers. The research was carried out in full compliance with the Good Clinical Practice guideline in the context of the Declaration of Helsinki.

RESULTS

In the research, participant patients' mean age was 55.14±8.10 years, and their mean duration of having the disease was 10.35±4.77 years. Also, of all participant patients, 28.1% were aged 41-51 years, 60.8% were female, 76.5% were married, 35% were secondary school graduates, 62.1% were members of extended families, and 26.5% had coronary artery disease. Besides, of all participant patients, 41.2% were diagnosed with diabetes mellitus for 4-7 years, 66.4% had complications, 39.8% had diabetic foot ulcers, 84% used insulin, 59.8% could self-administer the insulin, 80.1% had a family history of diabetes mellitus, 65.7% received diabetes training, and 68.3% regularly visited the doctor for controls. Also, it was found that patients who were aged 20-30 years, were male, used insulin, and received diabetes training had higher mean HFS scores than other corresponding groups of patients (p<0.05). Additionally, it was found that patients who were university graduates, worked, and received

diabetes training had higher mean HCS scores than other corresponding groups of patients (p<0.05) (Table 1).

Next, in the research, of all participant patients, 51.3% received no training about hypoglycemia, 55.9% had no knowledge about hypoglycemia, 38.2% did not know their hypoglycemic blood glucose levels, 24.8% ate sugar cubes during hypoglycemia, 24.8% had worry during hypoglycemia, 32.8% had hypoglycemia once or twice a year, and 31% exhibited hunger symptoms. Besides, it was found that patients who received training about hypoglycemia, had knowledge about hypoglycemia, knew their hypoglycemic blood glucose levels as 70 mg/dL or below, felt fear during hypoglycemia, and had hypoglycemia more than once a month had higher mean HFS scores than other corresponding groups of patients (p<0.05). Additionally, it was discerned that patients who received training about hypoglycemia, had knowledge about hypoglycemia, and knew their hypoglycemic blood glucose levels as 70 mg/dL or below had higher mean HCS scores than other corresponding groups of patients, and also, patients who had hypoglycemia more than once a month had a lower mean HCS score than other corresponding groups of patients (p<0.05) (Table 2).Moreover, in the research, mean scores obtained by participant patients from the HFS and its Behavior Sub-scale and Worry Sub-scale were successively 3.02±0.56, 2.43±0.18, and 2.87±0.10 points. Besides, the mean of participant patients' HCS scores was identified as 1.65±0.47 points.

Furthermore, in the research, it was found that patients' HCS scores had moderately negative relationships with their HFS, HFS Behavior Sub-scale, and HFS Worry Sub-scale scores (p<0.05). In this respect, first, the correlation coefficient for the relationship between patients' HCS and HFS scores was identified as -0.594 (moderately negative relationship, r=-0.594) (p<0.05). Second, the correlation coefficient for the relationship between patients' HCS and HFS Behavior Sub-scale scores was calculated as -0.405 (weak negative relationship, r=-0.405) (p<0.05). Third, the correlation coefficient for the relationship between patients' HCS and HFS Worry Sub-scale scores was found as -0.678 (strong negative relationship, r=-0.678) (p<0.05). Additionally, it was discerned that there was no statistically significant relationship between HFS scores, HFS Behavior Sub-scale scores, and HFS Worry Sub-scale scores (p>0.05) (Table 3,4).

Lastly, as per the linear regression analysis, it was identified that patients' HFS scores, HFS Behavior Sub-scale scores, and HFS Worry Sub-scale scores had negative effects on their HCS scores (R^2:0.49, F=2.001, p:0.001) (Table 5).

DISCUSSION

Hypoglycemia is the most frequently observed and most feared acute complication that has biophysical, psychosocial, environmental, and economic effects on diabetes patients' lives, particularly those using insulin. There can be differences between diabetic individuals in terms of the degree of feeling hypoglycemia symptoms. Diabetic individuals can give different responses to these different circumstances. Feeling fear about hypoglycemia is among these responses [12,13]. In the current study, it was discerned that type 2 diabetes patients had high levels of hypoglycemia fear. This finding of the current study is in parallel to the findings of other studies [13-15]. It can be considered that a large majority of the patients included in the current study felt hypoglycemia fear because they used

insulin, received diabetes training, and knew their hypoglycemic blood glucose levels. Additionally, it is thought that participant patients felt high-level fear as they might have experienced certain shortcomings in the self-management of hypoglycemia. Considering that the differences identified in the literature about the topic may have arisen from numerous factors such as the culture, lifestyle, economic situation, education level, current therapies, health systems, access to necessary knowledge and support, and access to healthcare, it is not possible to make a precise statement about the reason for patients to feel hypoglycemia fear [16-18].

Table 1. The comparison of patients' mean HFS And HCS scores as per their sociodemographic characteristics

Mean age (Mean±SD)				55.14±8.10 years	
Mean duration of having the disease (Mean±SD)				**10.35±4.77 years**	
Sociodemographic characteristics		**n**	**%**	**HFS**	**HCS**
Age group	20-30 years	60	19.6	3.61±0.28a	1.66±0.05
	41-51 years	86	28.1	3.34±0.36b	1.65±0.16
	52-62 years	76	24.8	2.60±0.08b	1.64±0.09
	63-73 years	84	27.5	2.50±0.01b	1.65±0.13
	p			0.015	0.120
Gender	Female	186	60.8	2.50±0.04	1.64±0.20
	Male	120	39.2	3.58 ± 0.10	1.66±0.18
	p			0.023	0.394
Marital status	Single	72	23.5	3.00 ± 0.34	1.51±0.71
	Married	234	76.5	3.05 ± 0.16	1.75±0.60
	p			0.128	0.702
Education level	Illiterate	71	23.2	3.01 ± 0.16	1.23±0.37b
	Primary school	60	19.6	3.01 ± 0.09	1.54±0.10b
	Secondary school	107	35.0	2.97 ± 0.11	1.50 ±0.30b
	University	68	22.2	3.03 ± 0.05	1.99±0.26a
	p			0.960	0.017
Family type	Nuclear family	116	37.9	3.02 ± 0.13	1.65±0.80
	Extended family	190	62.1	3.01 ± 0.07	1.64±0.46
	p			0.443	1.064
Employment status	Working	100	32.7	3.02 ± 0.19	1.88±0.40
	Not working	206	67.3	3.02 ± 0.31	1.45±0.31
	p			0.128	0.030
Other diagnosed chronic diseases	Hypertension	73	23.9	3.02 ± 0.31	1.64±0.91
	Hyperlipidemia	79	25.8	3.01 ± 0.19	1.64±0.18
	Coronary artery disease	81	26.5	3.01 ± 0.17	1.65±0.13
	Cerebrovascular disease	40	13.0	3.03 ± 0.08	1.65±0.27
	Chronic obstructive pulmonary disease	33	10.8	3.02 ± 0.34	1.66±0.36
	p			0.573	0.135
Duration of being diagnosed with diabetes	1-3 years	78	25.5	2.70 ± 0.10b	1.63±0.03
	4-7 years	126	41.2	3.00 ± 0.16b	1.65±0.15
	≥8 years	102	33.3	3.41 ± 0.29a	1.67±0.19
	p			0.020	0.706
Experiencing any complication	Yes	197	64.4	3.03 ± 0.09	1.65±0.43
	No	109	35.6	3.01 ± 0.12	1.66±0.24
	p			0.090	0.311
The complication experienced besides hypoglycemia	Neuropathy	64	20.9	3.06 ±0.33	1.64±0.17
	Diabetic foot ulcer	122	39.8	2.99±0.15	1.65±0.13
	Hyperglycemia	62	20.3	2.98±0.34	1.66±0.10
	Nephropaty	58	19.0	3.00±0.40	1.66±0.27
	p			0.077	0.340
Last drug therapy	Oral anti-diabetic drug and insulin	49	16.0	2.62±0.60	1.65±0.10
	Insulin	257	84.0	3.40±1.15	1.65±0.07
	p			0.036	0.801
Being able to self-administer the insulin	Yes	183	59.8	3.00±0.11	1.66±0.20
	No	74	24.2	3.03±0.30	1.65±0.18
	p			1.004	0.703
Having a family history of diabetes mellitus	Yes	245	80.1	3.02±0.07	1.65±0.02
	No	61	19.9	3.04±0.13	1.65±0.14
	p			0.067	0.129
Receiving diabetes training	Yes	201	65.7	3.62±1.37	1.99±0.70
	No	105	34.3	2.70±0.54	1.51±0.64
	p			0.019	0.041
Visiting the doctor regularly for controls	Yes	209	68.3	3.01±0.15	1.66±0.15
	No	97	31.7	3.04±0.18	1.64±0.82
	p			0.684	0.985

HFS: Hypoglycemia Fear Survey; HCS: Hyperglycemic Confidence Scale

Table 2. The comparison of patients' mean HFS and HCS scores as per their hypoglycemia-related characteristics

Hypoglycemia-Related Characteristics		n	%	HFS	HCS
Receiving training about hypoglycemia	Yes	149	48.7	3.42±1.25	1.75±0.26
	No	257	51.3	2.60±0.73	1.54±0.08
	p			0.018	0.025
Having knowledge about hypoglycemia	Yes	135	44.1	3.25±1.00	1.80±0.13
	No	171	55.9	2.80±0.14	1.42±0.39
	p			0.020	0.012
Knowing hypoglycemic blood glucose level	Having no idea	117	38.2	2.76±0.05b	1.48±0.70[b]
	70 mg/dL or below	100	32.7	3.39±0.36a	1.93±0.17[a]
	100 mg/dL or below	89	29.1	2.88±0.17b	1.55±0.94[b]
	p			0.013	0.040
What is done during hypoglycemia	I drink water with sugar	65	21.2	3.00±0.04	1.72±0.11
	I eat sugar cubes	76	24.8	3.02±0.16	1.65±0.34
	I do not know what to do	61	19.9	3.96±0.10	1.50±0.18
	I measure my blood glucose level	51	16.7	3.02±0.06	1.65±0.19
	I go to the closest hospital	53	17.4	3.03±0.19	1.64±0.36
	p			0.905	0.703
Emotions felt during hypoglycemia	Worry	76	24.8	2.90±0.02[b]	1.65±0.03
	Anger	55	18.0	2.88±0.08[b]	1.64±0.71
	Fear	109	35.6	3.16±0.43[a]	1.65±0.64
	Calm	66	21.6	2.76±0.66[b]	1.66±0.36
	p			0.020	0.239
Frequency of having hypoglycemia	Once or twice a year	100	32.8	2.61±0.05[b]	1.60±0.05[b]
	Once a month	88	28.7	3.00±0.99[b]	1.61±0.05[b]
	More than once a month	67	21.8	3.70±1.13[a]	1.23±0.05[a]
	Three or four times a year	51	16.7	2.23±0.04[b]	2.01±0.05[b]
	p			0.011	0.037
Symptoms exhibited during hypoglycemia	Hunger, perspiration, trembling, weakness	95	31.0	3.00±0.03	1.65±0.02
	Hunger, perspiration, trembling, anxiety, palpitation	66	21.5	3.02±0.05	1.64±0.11
	Headache, dizziness, hunger, perspiration, trembling	54	17.7	3.01±0.10	1.66±0.36
	Trembling, perspiration, difficulty in speaking, failure to concentrate	55	18.0	3.03±0.03	1.63±0.45
	Hunger, weakness	36	11.8	3.02±0.07	1.67 ±0.93
	p			1.175	0.235

HFS: Hypoglycemia Fear Survey, HCS: Hypoglycemic Confidence Scale

Table 3. Patients' mean HFS and HCS scores

Variables	Mean±SD	Min	Max
Overall HFS	3.02 ± 0.56	0	4
HFS Behavior Sub-scale	2.43 ± 0.18	0	4
HFS Worry Sub-scale	2.87 ± 0.10	0	4
Overall HCS	1.65±0.47	1	4

HFS: Hypoglycemia Fear Survey, HCS: Hypoglycemic Confidence Scale, SD: Standard Deviation, Min: Minimum, Max: Maximum

Table 4. The analysis of correlations between patients' HFS and HCS scores

Variables		HCS	HFS	HFS-Behavior	HFS-Worry
HCS	rho		-0.594	-0.405	-0.678
	p		0.036	0.013	0.028
HFS	rho	-0.594		0.124	0.102
	p	0.036		0.790	0.366
HFS-Behavior	rho	-0.405	0.124		0.230
	p	0.013	0.790		0.108
HFS-Worry	rho	-0.678	0.102	0.230	
	p	0.028	0.366	0.108	

rho: Spearman's correlation coefficient, 5%: significance level (p<0.05), HFS: Hypoglycemia Fear Survey, HCS: Hypoglycemic Confidence Scale

Table 5. Results of the linear regression model designed to identify the effect of patients' HFS scores on their HCS scores

	Regression model				%95 CI	
	B	**SE**	**OR**	**p**	**LB**	**UB**
Constant	1.742		5,580	0.000	0.630	2.954
HFS- B	-1.334	-0.126	-1.398	0.001	-0.997	-2.671
HFS-W	-1.427	-0.145	-1.839	0.001	-0.182	-2.673
HFS	-1.529	-0.132	-1.191	0.002	-0.703	-2.356

HFS: Hypoglycemia Fear Survey; HFS-B: Hypoglycemia Fear Survey Behavior, HFS-W: Hypoglycemia Fear Survey Worry, HCS: Hypoglycemic Confidence Scale, B:coefficient, SE:standard error, CI: confidence interval, OR:odds ratio, LB:lower bound,UB:upper bound

Besides, in the current study, patients had a mean age of 55.14±8.10 years, and it was discerned that, as age increased, the frequency of performing behaviors to avoid hypoglycemia dropped and hypoglycemia worry and fear decreased. As age increases, the severity of hypoglycemia symptoms felt by diabetic individuals' decreases. Along with the process of aging, the response of counter regulatory hormones to hypoglycemia subsides or disappears [12,13]. Studies examining the relationship between age and hypoglycemia fear put forward that severe hypoglycemia risk increased in old diabetes patients [13,19]. As young adults can be aware of hypoglycemia symptoms before the deterioration of their cognitive functions, they find the opportunity to intervene at the right time. However, most old patients who had been diagnosed with diabetes for a long time cannot feel autonomic hypoglycemia symptoms [17,18].

Moreover, in the current study, it was identified that patients who knew their blood glucose levels and received diabetes training felt higher levels of hypoglycemia fear. In a similar vein to the current study, previous studies asserted that the education level had an effect on hypoglycemia fear [13,14]. It is considered that feeling hypoglycemia fear may have been linked with the diabetic individuals' awareness about hypoglycemia [20,21]. Furthermore, in the current study, it was found that male patients obtained a higher mean HFS score than female patients and this difference was statistically significant, and in this regard, male patients felt higher levels of hypoglycemia fear. The finding of our study is contrary to the results of certain studies [13,17,19], and also, in the relevant literature, exhibited symptoms and the frequency of having severe hypoglycemia seizures were stated as causes of fear for both sexes [14,20]. Besides these two factors, it was put forward that hypoglycemia fear felt by men was associated with hypoglycemia symptoms, severe hypoglycemia, and failing to be aware of having hypoglycemia while hypoglycemia fear felt by women was associated with symptoms exhibited during hypoglycemia and the over interpretation of hypoglycemia symptoms [14,18]. Alongside this finding of the current study, it is considered that men may have felt higher levels of fear as men, in general, had anxiety about failing to have main meals and mini meals regularly due to

spending more time outdoors during the day and thought that they could not be aware of hypoglycemia symptoms [15,17]. Additionally, in the current study, it was discerned that patients who were diagnosed with diabetes for longer than eight years felt higher levels of hypoglycemia fear. In the relevant literature, it is stated that, as the duration of being diagnosed with diabetes increased, there were deteriorations in patients' awareness about hypoglycemia symptoms. In this situation, diabetes patients can feel fear about hypoglycemia by thinking that they will fail to be aware of severe hypoglycemia symptoms [19,20].

Next, in the current research, it was found that patients who had hypoglycemia more than once a month obtained a higher mean HFS score. In the study by Wang et al. (2021), it was identified that, as the frequency of having hypoglycemia increased, anxiety and fear felt about hypoglycemia increased [13]. Also, in the current research, it was discerned that patients who used insulin obtained a higher mean HFS. Especially diabetes patients using insulin can feel fear along with the thinking that they will be ridiculed and laughed at, will need assistance from other individuals, and will lose their self-control due to having hypoglycemia [14,15]. In the relevant literature, it was put forward that hypoglycemia fear was common among type 2 diabetes patients using insulin, and this situation was associated with the insulin injection self-administered by patients [17,18].

It is known that positive concepts such as hypoglycemic confidence are important to the delivery of health services. A large number of research studies performed on diabetes and other health conditions confirmed that self-confidence in personal knowledge and/or abilities was likely to have a significant effect on self-care behaviors and clinical outcomes [22,23]. In the relevant literature, there is a quite limited number of studies conducted about hypoglycemic confidence [8,24,25]. In the current study, the mean of participant type 2 diabetes patients' HCS scores was identified as 1.65±0.47 points. In the relevant literature, it was indicated that having adequate knowledge and resources for the management of hypoglycemia would enhance the hypoglycemic confidence level. As well as having access to knowledge, it is also quite important to understand the acquired knowledge and integrate it into life [8,25]. In our study, it was found that there was a statistically significant difference in patients' mean HCS scores as per the variable of education level. In this respect, in the current research, university graduate patients had a higher mean HCS score than other corresponding groups of patients.

In the study by Polonsky et al. (2017), a relationship was identified between the long education duration and HCS scores [8]. The facilitation of an individual's learning process along with the increase in education level raises the individual's awareness about diabetes, and hence, increases the individual's control over hypoglycemia. It is considered that not having difficulty in the management of hypoglycemia due to not experiencing any trouble in setting the insulin dose to be taken and in reading and evaluating the measurement result in the glucometer may have enabled diabetic individuals to have higher levels of hypoglycemic confidence [22,23].

Furthermore, in our study, it was discerned that there was a statistically significant difference in patients' mean HCS scores as per the variable of employment status. In this respect, it was found that working patients had a higher mean HCS score than those not working (p<0.05). Working life, adaptation to work, work-life balance, and having health insurance and a certain amount of income due to working have certain positive aspects such as having the opportunity to have easier access to medication and materials necessary for the treatment and management of diabetes. Along with all these reasons and the effect of advantages such as the creation of a timetable for having a regular diet at specific hours in working life, it is considered that working life had a positive effect on individuals' hypoglycemic confidence levels just as in the case of our study [24,25]. Besides, in our study, it was identified that there was a statistically significant difference in patients' mean HCS scores as per the variable of receiving diabetes training.

In this sense, patients who received training about diabetes had higher levels of hypoglycemic confidence. It is considered that patients receiving diabetes training had higher levels of hypoglycemic confidence in association with having a lower rate of having hypoglycemia along with the enhancement of their knowledge levels and improvement of their adaptation to treatment. Also as per the relevant literature, training is the most fundamental need for the enhancement of diabetic individuals' hypoglycemic confidence levels [22,25]. Moreover, in our study, it was found that there was a statistically significant difference in patients' hypoglycemic confidence levels as per the variable of the frequency of having hypoglycemia. It was discerned that patients stating that they frequently had hypoglycemia had a lower mean HCS score. Alongside this finding, it is considered that the hypoglycemic confidence level may have decreased in association with the thinking that the situation could not be managed as the frequency of having hypoglycemia increased. Additionally, in our study, it was discerned that patients who received hypoglycemia training had a higher mean HCS score than those receiving no hypoglycemia training. It was indicated that the enhancement of individuals' hypoglycemia-related knowledge, awareness, and competencies increased their hypoglycemic confidence levels by strengthening their self-efficacy [22-25].

Lastly, upon the review of the relationship between patients' HFS and HCS scores in our study, it was found that there was a negative relationship between patients' HFS and HCS scores. Besides, as per the linear regression analysis, it was identified that patients' HFS scores, HFS Behavior Sub-scale scores, and HFS Worry Sub-scale scores had negative effects on their HCS scores. As the patients' hypoglycemia fear levels increase, their hypoglycemic confidence levels decrease. The concept of hypoglycemic confidence is absolutely independent of the concept of hypoglycemia fear, and a negative relationship was identified between the two concepts. Hypoglycemia fear stems from the fact that hypoglycemia is likely to be in place at any moment of the diabetic individual's life and will give rise to severe clinical symptoms [21,26]. By enabling diabetic individuals to attain full hypoglycemic confidence, these individuals' hypoglycemia fears can be minimized [23,27]. Also, as diabetic individuals' hypoglycemia fears in terms of the HFS Behavior Sub-scale and Worry Sub-scale increase, their hypoglycemic confidence levels decrease. In light of these points, it is discerned that the findings of our study are in line with the relevant literature [26,27].

Limitations

This study covers solely type 2 diabetes mellitus patients who visited the diabetes polyclinic of a faculty of medicine in Turkey to have treatments and agreed to participate in the research, and hence, the research results cannot be generalized to all type 2 diabetes mellitus patients.

CONCLUSION

According to the data obtained in the study, there was a negative relationship between patients' hypoglycemic confidence and hypoglycemia fears. Living with hypoglycemia fear can reduce the patient's hypoglycemic confidence. To enhance patients' hypoglycemic confidence levels, their hypoglycemia-related fears should be reduced.

This will be possible if patients develop behaviors for the self-management of the blood glucose level, can be aware of hypoglycemia symptoms, and apply interventions necessary to prevent complications developing alongside diabetes. So that patients can take all the above-mentioned steps, first, patients should receive good-quality diabetes and hypoglycemia training besides having effective and safe treatment options, second, whether patients have up-to-date information should be followed up by members of the health team, and third, patients should be frequently controlled.

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