European Review for Medical and Pharmacological Sciences 2023; 27: 1592-1600

The relationship between fear of hypoglycemia and health-related quality of life in diabetic patients with heart disease

S. TUREN[1], R.G. YILMAZER[2]

[1]Department of Nursing, Faculty of Health Sciences, Istanbul Kültür University, Istanbul, Turkey
[2]Department of Cardiology, Bursa City Hospital, Bursa, Turkey

Abstract. – OBJECTIVE: Individuals with Diabetes Mellitus (DM) frequently experience hypoglycemia, which has significant implications for the possibility of cardiovascular complications. The relationship between fear of hypoglycemia (FoH) and health-related quality of life (HRQoL) in diabetic heart patients was investigated in this study.

SUBJECTS AND METHODS: This was a descriptive study, and 260 diabetic inpatients with heart disease were enrolled. The "Data Gathering Form", the "Hypoglycemia Fear Survey" (HFS), and the "Short-Form Health Survey (SF-36)" were used to collect research data.

RESULTS: The mean age of the patients was 63.46±11.73 (min 21-max 90) years, and 76.2% of them had type 2 DM. The mean FoH total score of the patients was 70.87±8.03 (min 45-max 113). The mean FoH behavior sub-dimension score was 35.41±4.07 (min 20-max 57), and the mean worry sub-dimension score was 35.55±5.26 (min 20-max 61). The mean total FoH score was found to be significantly higher in patients of 65 years of age and older, not working, with diabetes duration over 10 years, with HbA1c <7%, and with microvascular complications (p<0.05). Of the sub-dimensions of SF-36, "mental health" had the lowest mean score. There was a significant but very weak negative correlation between the other sub-dimensions of SF-36, "physical functioning", "role physical", "role emotional" and "vitality", with the FoH total score.

CONCLUSIONS: FoH and HRQoL in diabetic patients with heart disease were found to be negatively correlated in this study. Prevention of hypoglycemia will improve patients' HRQoL by reducing their anxiety and fears.

Key Words:
Diabetes mellitus, Heart disease, Fear of hypoglycemia, Quality of life.

Introduction

Diabetes mellitus (DM) is an important health problem, and its prevalence has been rising to alarming levels. It is estimated that there are approximately 537 million adults (20-79 years old) with diabetes worldwide, and this number will increase to 783 million in 2045[1]. Hypoglycemia is one of the most important limiting factors in the management of DM[2]. Insulin and insulin secretagogues, which are used to provide glycemic control in the treatment of diabetes, may cause frequent hypoglycemia in individuals with diabetes[3].

Hypoglycemia is defined by the American Diabetes Association (ADA) as a condition characterized by abnormally low blood glucose levels, usually less than 70 mg/dL (level 1: 54-69 mg/dL, level 2: <54 mg/dL, and level 3: a severe event characterized by altered mental and/or physical status requiring assistance for hypoglycemia treatment)[3]. Hypoglycemia can cause symptoms such as headaches, hunger, irritability, tachycardia, etc., and may result in confusion, coma, and even death depending on the level of hypoglycemia[2,3]. The signs and symptoms of hypoglycemia may not be as severe in everyone. This is because of individual differences (existing health status, comorbid conditions, diabetes duration, etc.), or the individual's response to these symptoms may differ[4,5]. In addition, hypoglycemia episodes may occur during sleep, but this may not be perceived by the patient[6].

Poor glycemic control and severe hypoglycemic episodes are associated with diabetes complications in patients with diabetes, increased risk for cardiovascular outcomes, and all-cause mortality[2,7-9]. Hypoglycemia significantly increases the risk of cardiovascular complications because

Corresponding Author: Sevda Turen, RN, Ph.D; e-mail: sevdamercanhm@hotmail.com

it can cause decreased blood flow in the heart and cardiac electrical disturbances (arrhythmia, prolonged QT interval). Hypoglycemia can cause angina or acute myocardial infarction, especially in people with coronary artery disease[2,6].

Hypoglycemia can have a significant impact on people's lives because it has the potential to impair one's cerebral functions[2,5]. Furthermore, a variety of negative situations ranging from disruption of daily activities to psychosocial problems can have a significant impact on an individual's health related quality of life (HRQoL)[2,9-11]. As a result, hypoglycemia can be upsetting and frightening for patients, especially for those with heart diseases[2]. A high level of FoH in patients may result in behaviors that are inappropriate to the actual risk of hypoglycemia, suboptimal metabolic control of diabetes, and a significant reduction in the patient's health related HRQoL[11]. The aim of this study was to investigate the impact of hypoglycemia fear on the HRQoL in diabetic patients with heart disease.

Research Questions

1. What are the socio-demographic characteristics of diabetic patients with heart disease?
2. What is the level of FoH in diabetic patients with heart disease?
3. What is the HRQoL of diabetic patients with heart disease?
4. What is the relationship between the level of FoH and HRQoL in diabetic patients with heart disease?

Subjects and Methods

This is a prospective study carried out at tertiary care facility cardiology inpatient clinics between April and September 2022. The study complies with the ethical standards specified in the Helsinki Declaration. Appropriate permission was obtained from the institution where the study was conducted. The study was approved by the University Institutional Review Board (IRB date and number: 17.03.2022/2022.55). Informed consent was obtained from all individual participants included in the study. The participants were assured that their responses would remain anonymous and confidential.

Patient Selection

Patients with heart disease and type 1 or type 2 diabetes who were over 18 years of age with a duration of diabetes of one year or more without cognitive dysfunction and who accepted to participate in the study were included. Patients with heart disease who had diabetes for less than a year, had a myocardial infarction in the previous six months, had a psychiatric problem, were pregnant, or had a malignant tumor or declined to participate in the study were excluded from the study.

Data Gathering Form

The data-gathering form was prepared by the researchers in light of the literature review. This form consisted of 23 questions about socio-demographic characteristics (age, gender, marital status, education level, comorbidities, etc.) as well as information about diabetes (duration of illness, knowledge about hypoglycemia, hospitalization within the last year, regular physician).

Hypoglycemia Fear Survey (HFS)

This scale was developed by Cox et al[12] to determine the fear of hypoglycemia in individuals with diabetes. Its Turkish validity and reliability were made by Erol and Enç[13]. The scale, which consists of 32 items, has two sub-dimensions (behavior and worry). Participants were asked to indicate their fear of hypoglycemia for each of the 32 items on the 5-point Likert-type HFS from 0 (never) to 4 (always). The range of points to be taken from the scale varies between 0 and 128; there is no cut-off point for scoring. As the score obtained from the scale increases, the level of fear of hypoglycemia increases. The Turkish reliability and validity study revealed that the HFS's Cronbach's alpha value was 0.90. It was found to be 0.80 in this investigation.

Short Form Health Survey (SF-36)

The Short Form Health Survey (SF-36) was created in 1993 by Ware et al[14] and Koçyiğit et al[15] adapted it into Turkish. The SF-36 has eight sub-domains in addition to its two primary domains (the physical and the mental). Each sub-domain of the questionnaire is scored separately rather than as a whole, with values ranging from 0 to 100. A high SF-36 score indicates a better HRQoL. According to the validity and reliability of the study conducted in Turkish, Cronbach's alpha was determined to range from 0.73 to 0.76 for each subgroup. This study found that it ranged from 0.79 to 0.85.

Statistical Analysis

Continuous variables were expressed as mean ± SD, and categorical variables were expressed as numbers and percentages. The normality of the continuous variables was tested using the Shapiro-Wilk test. The total FoH and sub-dimensions of FoH scores were compared across socio-demographic and clinical characteristics of the patients using the Student's *t*-test or one-way analysis of variance (ANOVA) test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. Post-hoc analyses were performed where appropriate, using Bonferroni correction. Relationships between variables were analyzed by using Pearson's correlation analyses. Two-sided *p*-values of 0.05 were considered significant for all tests. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows (IBM Corp., Armonk, NY, USA).

Results

Socio-Demographic and Clinical Characteristics of the Patients

Two hundred and sixty diabetic patients with heart disease participated in the study. The mean age of the patients included in the study was 63.46±11.73 (min 21-max 90) years, and the duration of the DM was 135.35±98.39 (min 12-max 480) months. The majority of the patients were male (61.5%), married (73.1%), had an education level less than high school (76.5%), were not working (63.5%), and lived with a family member (90.4%). While 76.2% of the patients had type 2 diabetes, 78.8% had no microvascular complication, and 13.8% had experienced a hypoglycemia episode in the last year. In addition, 58.5% of the patients reported that they received diabetic education, and 73.5% of them were compliant with regular physician follow-ups. The baseline characteristics of patients are shown in Table I.

Fear of Hypoglycemia of Patients

The mean total FoH score of the patients was 70.87±8.03 (min 45-max 113). The mean FoH behavior sub-dimension score was 35.41±4.07 (min 20-max 57), and the mean worry sub-dimension score was 35.55±5.26 (min 20-max 61). The behavior sub-dimension mean score was found to be significantly higher in patients 65 years of age or older (p=0.02), with diabetes duration over 10 years (p=0.04), with microvascular complications (p=0.03), hypoglycemia episode in the last year (p=0.04), and with hospitalization (p=0.03). The mean worry sub-dimension score was significantly higher in patients 65 years of age or older (p=0.006), not-working (p=0.01), with HbA1c <7% (p=0.03), and with microvascular complications (p=0.03). The mean total FoH score was found to be significantly higher in patients of 65 years of age and older (p=0.02), not working (p=0.003), with diabetes duration over 10 years (p=0.02), with HbA1c <7% (p=0.03), and with microvascular complications (p=0.03) (Table I).

Patients' Health-Related Quality of Life

Patients' socio-demographic and clinical characteristics and quality of life across these characteristics are shown in **Supplementary Table I**. Considering the patients' SF-36 scores, "bodily pain" had the highest score (52.21±23.71), and "mental health" had the lowest score (35.20±14.58). The physical component summary score and mental component summary score, which are the sub-dimensions of the SF-36, were found to be 48.01±21.87 and 43.70±17.56, respectively (Table II).

The Relationship Between Patients' Fear of Hypoglycemia and Health-Related Quality of Life

There were negative but very weak correlations between the "physical role" and "vitality", which are SF-36 sub-dimensions and FoH behavior sub-dimension (r= -0.127, p=0.04, r= -0.165, p=0.008, respectively). The SF-36 sub-dimensions "physical role" and "general health" were significantly but weakly correlated with the FoH worry sub-dimension (r= -0.141, p=0.02; r= -0.034, p=0.003, respectively). Furthermore, there was a significant but very weak negative correlation between the SF-36 sub-dimensions of "physical functioning", "physical role", "emotional role", and "vitality" and the total FoH score (r= -0.134, p=0.03, r= -0.128, p=0.04, r= -0.133, p=0.03, respectively) (Table III).

Discussion

In diabetic patients, hypoglycemia can affect cardiovascular functions, leading to myocardial ischemia, cardiac arrhythmias, and even death. Therefore, the fear of hypoglycemia in

Table I. Patients' socio-demographic and clinical characteristics, and fear of hypoglycemia across these characteristics (n = 260).

		FoH- Behavior			FoH-Worry			Total Score of FoH		
	N (%)	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*
Age (year)			-2.216*	0.02		-2.270*	**0.006**		-3.213*	0.002
< 65 years	136 (52.3)	34.87 ± 3.42			34.69 ± 4.38			69.34 ± 6.11		
≥ 65 years	124 (47.7)	36.01 ± 4.64			36.51 ± 5.98			72.57 ± 9.49		
BMI (kg/m^2)			-1.480*	0.14		-1.666*	0.10		-1.906*	0.60
Obese	39 (15.0)	36.56 ± 5.50			37.31 ± 7.48			74.02 ± 11.58		
Non-obese	221 (85.0)	35.21 ± 3.74			35.24 ± 4.72			70.32 ± 7.12		
Gender			0.020*	0.98		0.905*	0.37		0.751*	0.45
Female	100 (38.5)	35.42 ± 5.09			35.93 ± 5.63			71.35 ± 9.37		
Male	160 (61.5)	35.41 ± 3.31			35.32 ± 5.03			70.58 ± 7.11		
Marital status			1.092*	0.27		-1.497*	0.13		-0.015*	0.98
Married	190 (73.1)	35.58 ± 4.39			35.26 ± 5.27			70.87 ± 8.60		
Single	70 (26.9)	34.96 ± 3.03			36.36 ± 5.20			70.88 ± 6.29		
Education level			1.480*	0.14		1.163*	0.24		1.411*	0.16
< High school	199 (76.5)	35.62 ± 4.24			35.76 ± 5.37			71.26 ± 8.24		
≥ High school	61 (23.5)	34.74 ± 3.43			34.87 ± 4.88			69.61 ± 7.21		
Working status			-1.878*	0.06		-2.566*	0.01		-3.050*	0.003
Working	95 (36.5)	34.79 ± 3.67			34.51 ± 4.57			69.05 ± 6.36		
Not working	165 (63.5)	35.77 ± 4.26			36.15 ± 5.55			71.92 ± 8.69		
Economic status			2.597¥	0.07		0.059¥	0.94		0.886¥	0.41
Income more than expenses	133 (51.2)	34.86 ± 3.93			35.45 ± 5.14			70.28 ± 8.23		
Income partially covers expenses	104 (40.0)	35.94 ± 4.18			35.63 ± 5.33			71.67 ± 8.25		
Income less than expenses	23 (8.8)	36.22 ± 4.14			35.78 ± 5.88			70.69 ± 5.36		
Health insurance			0.651*	0.52		-0.287*	0.77		0.100	0.92
Yes	249 (95.8)	35.44 ± 4.08			35.53 ± 5.21			70.88 ± 7.94		
No	11 (4.2)	34.64 ± 4.03			36.00 ± 6.57			70.63 ± 10.38		
Smoke			-3.359*	0.72		-1.900*	0.06		-1.720*	0.08
Yes	121 (46.5)	35.31 ± 3.47			34.89 ± 4.8			69.96 ± 6.61		
No	139 (53.5)	35.50 ± 4.54			36.13 ± 5.57			71.67 ± 9.03		
Alcohol			-0.315*	0.75		-0.938*	0.34		-0.336*	0.73
Yes	34 (13.1)	35.20 ± 3.97			34.76 ± 4.66			70.44 ± 8.26		
No	226 (86.9)	35.44 ± 4.10			35.67 ± 5.35			70.94 ± 8.01		
Home status			-0.088*	0.93		-0.006*	0.99		0.414*	0.38
Living alone	25 (9.6)	35.48 ± 2.08			35.56 ± 5.36			70.24 ± 2.92		
Living with a family member	235 (90.4)	35.40 ± 4.23			35.55 ± 5.26			70.94 ± 8.39		
Type of diabetes			-1.198*	0.23		-1.589*	0.55		-0.600*	0.54
Type 1	62 (23.8)	34.87 ± 5.25			35.21 ± 5.33			70.34 ± 9.66		
Type 2	198 (76.2)	35.58 ± 3.63			35.66 ± 5.25			71.04 ± 7.46		

Continued

Table I *(Continued).* Patients' socio-demographic and clinical characteristics, and fear of hypoglycemia across these characteristics (n = 260).

		FoH- Behavior			FoH-Worry			Total Score of FoH		
	N (%)	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*
Duration of illness			3.268¥	0.04		1.036¥	0.35		3.639¥	0.02
< 60 months	71 (27.3)	34.41 ± 3.17			34.80 ± 4.45			68.73 ± 5.73		
61-120 months	78 (30.0)	35.54 ± 3.97			35.70 ± 5.65			71.37 ± 8.83		
> 120 months	111 (42.7)	35.96 ± 4.55			35.93 ± 5.45			71.89 ± 8.49		
HbA1C (%)			1.738*	0.14		2.103*	0.03		2.515*	0.03
< 7	81 (31.2)	36.06 ± 5.30			36.70 ± 6.46			72.72 ± 10.61		
≥ 7	179 (68.8)	35.12 ± 3.35			35.03 ± 4.54			70.04 ± 6.40		
Cardiac diagnosis			0.300¥	0.87		1.259¥	0.28		0.918¥	0.45
Heart failure	58 (22.3)	35.36 ± 4.97			36.27 ± 6.11			70.95 ± 9.46		
Acute coronary syndrome	120 (46.2)	35.27 ± 3.35			35.93 ± 5.17			71.21 ± 7.89		
Valvular heart disease	21 (8.1)	36.24± 3.33			36.00 ± 2.74			72.24 ± 5.44		
Atrial fibrillation	17 (6.5)	35.82 ± 3.26			37.06 ± 7.24			73.47 ± 9.93		
Other	44 (16.9)	35.29 ± 4.28			34.82 ± 4.85			70.07 ± 7.61		
Has a first degree relative with diabetes			-0.646*	0.51		-1.096*	0.27		-0.953*	0.34
Yes	164 (63.1)	35.29 ± 3.57			35.26 ± 4.53			70.48 ± 7.07		
No	96 (36.9)	35.62 ± 4.82			36.06 ± 6.32			71.54 ± 9.45		
Presence of comorbidities			0.857*	0.39		1.392*	0.16		1.254*	0.21
Yes	170 (65.4)	35.56 ± 4.35			35.84 ± 5.93			71.28 ± 8.83		
No	90 (34.6)	35.13 ± 3.48			35.01 ± 3.66			70.10 ± 6.22		
Treatment			-1.703*	0.09		-0.553*	0.58		-1.008*	0.31
Insulin	68 (26.2)	34.69 ± 5.27			35.25 ± 5.52			70.03 ± 9.92		
OAD	192 (73.8)	35.67 ± 3.53			35.66 ± 5.18			71.17 ± 7.25		
Presence of microvascular complication			2.162*	0.03		2.202*	0.03		2.498*	0.01
Yes	55 (21.2)	36.76 ± 5.60			37.38 ± 7.47			71.17 ± 7.25		
No	205 (78.8)	35.05 ± 3.48			35.06 ± 4.39			70.03 ± 9.92		
Received diabetic education			-0.930*	0.35		-0.397*	0.69		-0.889*	0.37
Yes	152 (58.5)	35.21 ± 4.13			35.44 ± 5.04			74.14 ± 11.86		
No	108 (41.5)	35.69 ± 3.99			35.70 ± 5.58			69.99 ± 6.40		
Diabetic education given by?			-1.900*	0.06		-0.291*	0.81		-1.250*	0.21
Nurse/Physician	119 (78.1)	34.84 ± 3.75			35.27 ± 5.29			69.91 ± 7.58		
Other	33 (21.9)	36.64 ± 5.09			35.91 ± 4.06			72.54 ± 8.57		
Regular physician follow-up			0.048*	0.96		1.396*	0.16		0.651*	0.51*
Yes	191 (73.5)	35.42 ± 4.01			35.83 ± 5.50			71.07 ± 7.99		
No	69 (26.5)	35.39 ± 4.28			34.80 ± 4.51			70.33 ± 8.17		

Continued

Table I *(Continued).* Patients' socio-demographic and clinical characteristics, and fear of hypoglycemia across these characteristics (n = 260).

		FoH- Behavior			FoH-Worry			Total Score of FoH		
	N (%)	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*	Mean ± SD	*t*, F	*p*
Have you experienced any hypoglycemia episode within the last year?			-2.032*	0.04		0.070*	0.94		-0.904*	0.36
Yes	36 (13.8)	35.61 ± 4.06			35.61 ± 6.46			71.05 ± 7.77		
No	224 (86.2)	34.14 ± 3.96			35.54 ± 5.06			69.75 ± 9.54		
Hospitalization within the last year			-2.161*	0.03		-0.500*	0.96		-1.046*	0.29
Yes	37 (14.2)	35.63 ± 4.06			35.56 ± 5.07			71.08 ± 7.77		
No	223 (85.8)	34.08 ± 3.92			35.51 ± 6.40			69.59 ± 9.46		

BMI: Body mass index, FoH: Fear of hypoglycemia, HbA1C: Glycated hemoglobin, OAD: Oral antidiabetic Significant difference at $p < 0,05$; value in bold: significant; *Students *t*-test (t), ¥ANOVA (F).

Table II. Patients' health-related quality of life.

SF-36	Mean ± SD (min-max)
Physical Functioning (0-100)	48.65 ± 40.13 (0-100)
Role Physical (0-100)	48.36 ± 42.48 (0-100)
Bodily Pain (0-100)	52.21 ± 23.71 (10-100)
General Health (0-100)	42.83 ± 15.50 (10-100)
Role Emotional (0-100)	49.61 ± 43.71 (0-100)
Vitality (0-100)	39.42 ± 25.29 (10-80)
Mental Health (0-100)	35.20 ± 14.58 (16-56)
Social Functioning (0-100)	50.48 ± 16.65 (25-75)
Physical Component Summary (0-100)	48.01 ± 21.87 (10.00-91.25)
Mental Component Summary (0-100)	43.70 ± 17.56 (12.75-77.75)

diabetic patients can prevent optimal glycemic control by changing their self-management of the disease.

When the studies[11,16,17] on diabetic patients are reviewed, it is seen that some demographic and diabetes-related factors of the patients, particularly advanced age and the duration of diabetes, affect the FoH level. Wang et al[10] found that age, diabetes education, hospitalization for diabetes, and a history of hypoglycemia were all strongly associated with HoF in a study of 385 patients with type 2 diabetes. In their systematic review, Zhang et al[18] revealed that FoH levels were higher in elderly diabetics. In this study, in parallel with the literature, FoH levels were found to be higher in patients over 65 years of age, not working, and with a diabetes duration of 10 years or more. Hypoglycemia can seriously affect working life and other social activities[10]. Additionally, as the duration of diabetes increases, the loss of β cells progressively hinders paracrine crosstalk between the α and β cells, leading to impaired glucagon release during hypoglycemia. This makes individuals more susceptible to hypoglycemia[19]. In patients with long-term diabetes, experiencing more hypoglycemic episodes and having greater hypoglycemia experience may also be associated with FoH.

Patients who have had severe hypoglycemia or recurrent episodes of hypoglycemia may develop a fear of not noticing the hypoglycemia, developing hypoglycemia alone or while sleeping, losing control, and being involved in an accident. They also develop a fear of being negatively judged by others, a permanent harm to their health, and death[4,9,11,18]. In this study, the behavior sub-dimension of FoH was found to be significantly higher in patients who had an episode of hypoglycemia in the last year and were hospitalized. Although this finding is consistent with previous research[10,11,20], it should be noted that both the physical and psychological effects of previous attacks can cause anxiety and fear. In addition, in the study of Yüksel and Bektaş[20] (n=376), the increase in FoH was found to be associated with poor compliance. Patient education is the most important role of nurses in diabetes management.

Table III. Relationship between the patients' fear of hypoglycemia and health-related quality of life.

		SF-36							
		Physical functioning	Role physical	Bodily pain	General health	Role emotional	Vitality	Mental health	Social functioning
FoH- Behavior	r	-0.093	-0.127	0.016	-0.054	-0.109	-0.165	-0.049	-0.027
	p	0.13	0.04	0.80	0.38	0.08	0.008	0.43	0.66
FoH- Worry	r	-0.101	-0.141	-0.031	-0.034	-0.107	-0.054	0.040	-0.042
	p	0.10	0.02	0.61	0.03	0.08	0.38	0.51	0.50
Total FoH	r	-0.134	-0.134	-0.021	-0.109	-0.128	-0.133	-0.004	-0.041
	p	0.03	0.03	0.73	0.07	0.04	0.03	0.95	0.51

r: correlation coefficient; using Pearson's correlation analyses.

Lack of awareness of hypoglycemia or more than one severe hypoglycemia episodes should suggest the need for education on this issue and reconsideration of the treatment regimen.

HbA1c measures the average blood glucose level over the previous three months and is highly predictive of diabetic complications[2]. Although a low HbA1c level is desirable, it can be associated with a predisposition to hypoglycemia in patients with DM. Lower HbA1c levels are linked to an increased frequency of severe hypoglycemia, as well as increased mortality and cardiovascular events in diabetics[2]. Patients who have high levels of FoH tend to maintain higher glucose levels to prevent hypoglycemia[21]. In this study, however, the FoH level was found to be higher in patients with HbA1c values less than 7%. This situation can be linked to increased FoH, which stimulates greater vigilance and motivates patients to achieve more effective glycemic control.

High levels of fear and worry cause discomfort and insecurity, resulting in a significant decrease in diabetes patients' HRQoL[11]. Jodar et al[22] discovered that an increase in FoH had a negative impact on the patient's HRQoL in a study involving 4,054 patients with type 2 diabetes. Huang et al[16] (n=150) also reported that FoH had a negative impact on HRQoL. This study revealed that the HRQoL of the patients was affected, but the level of effect was minimal. Additionally, it was found that the mental health and vitality sub-dimensions of SF-36 are mostly affected. Studies[16,18,20,23-25] in the literature report that FoH affects the physical and mental states of individuals, and this situation significantly reduces their HRQoL.

It has been reported[4,16] that diabetes-related complications are associated with FoH because it affects the general health status of individuals. In this study, in line with the literature, both the FoH total score and sub-dimension scores were found to be high in patients with microvascular complications (retinopathy, nephropathy, and neuropathy). Recurrent hypoglycemia episodes have been shown to substantially increase FoH and aggravate cardiovascular problems. Therefore, this is something that should not be disregarded.

Limitations

The main limitation of this study was the inclusion of a limited number of patients in a single center. Only diabetic patients with heart disease were included in this study. Therefore, it cannot be generalized to diabetic patients without heart disease.

Conclusions

In order to reduce morbidity and mortality in diabetic patients with heart disease, hypoglycemia needs to be prevented. In addition to being an important factor in diabetes management, FoH has a significant impact on a patients' HRQoL. As a result, efforts should be made to reduce individuals' anxiety and fears in order to improve patients' HRQoL. Personalizing glycemic targets, including patients in diabetes education programs, providing regular education, evaluating hypoglycemia frequencies and coping methods, and performing regular follow-ups are all recommended.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Ethics Approval

This study was approved by the Istanbul Kültür University Non-interventional Ethical Board.

Informed Consent

All patients provided written informed consent.

Authors' Contribution

Concept, design, resources, materials, analysis and/or interpretation, literature search, writing manuscript, critical review: ST, RGY; Supervision: ST; Data collection and/or processing: RGY.

Funding

No funding was requested for this study.

Availability of Data and Materials

Data are available upon request to the corresponding author.

ORCID ID

Sevda Turen: 0000-0003-1123-5879; Rabia Gulnur Yilmazer: 0000-0002-6349-1324.

References

1) International Diabetes Federation (IDF). IDF Diabetes Atlas 2021. 10th edition. Available at: http://diabetesatlas.org/idfawp/resource-files/2021/07/IDF_Atlas_10th_Edition_2021.pdf (accessed on: 12.10.2022)

2) International Hypoglycemia Study Group. Hypoglycemia, cardiovascular disease, and mortality in diabetes: epidemiology, pathogenesis, and management. Lancet Diabetes Endocrinol 2019; 7: 385-396.

3) American Diabetes Association (ADA). Glycemic targets: standards of medical care in diabetes-2022. Diabetes Care 2022; 45: S83-S96.

4) Gül Ş, Duru Aşiret G, Okatan C. Examination of hypoglycemia fear of patients with type 2 diabetes mellitus. DEUHFED 2021; 14: 179-187.

5) Ibrahim M, Baker J, Cahn A, Eckel RH, El Sayed NA, Fischl AH, Gaede P, Leslie RD, Pieralice S, Tuccinardi D, Pozzilli P, Richelsen B, Roitman E, Standl E, Toledano Y, Tuomilehto J, Weber SL, Umpierrez GE. Hypoglycemia and its management in primary care setting. Diabetes Metab Res Rev 2020; 36: e3332.

6) Yigit Z. Hypoglycemia and its importance in cardiovascular disease. Yigit Z, editor. Diabet and Heart Disease. Ankara: Turkiye Klinikleri 2020; 36-40.

7) Yun JS, Park YM, Han K, Cha SA, Ahn YB, Ko SH. Severe hypoglycemia and the risk of cardiovascular disease and mortality in type 2 diabetes: a nationwide population-based cohort study. Cardiovasc Diabetol 2019; 18: 1-12.

8) Khunti K, Davies M, Majeed A, Thorsted BL, Wolden ML, Paul SK. Hypoglycemia and risk of cardiovascular disease and all-cause mortality in insulin-treated people with type 1 and type 2 diabetes: a cohort study. Diabetes Care 2015; 38: 316-322.

9) Johnson-Rabbett B, Seaquist ER. Hypoglycemia in diabetes: the dark side of diabetes treatment. A patient-centered review. J Diabetes 2019; 11: 711-718.

10) Wang Y, Zeng Z, Ding J, Yuan R, Wang R, Zhang Y, Bai L, Yu H, Tang J. Fear of hypoglycaemia among patients with type 2 diabetes mellitus: a cross-sectional study. Sci Rep 2021; 11: 7971.

11) Przezak A, Bielka W, Molęda P. Fear of hypoglycemia-An underestimated problem. Brain Behav 2022; 12: e2633.

12) Cox DJ, Irvine A, Gonder-Frederick L, Nowacek G, Butterfield J. Fear of hypoglycemia: quantification, validation, and utilization. Diabetes Care 1987; 10: 617-621.

13) Erol Ö, Enç N. Hypoglycemia fear and self-efficacy of Turkish patients receiving insulin therapy. Asian Nurs Res 2011; 5: 222-228.

14) Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 health survey manual and interpretation guide. New England Medical Center, the Health Institute, Boston, 1993.

15) Koçyiğit H, Aydemir Ö, Fişek G, Ölmez N, Memiş A. Turkish validity and reliability of Short-Form 36 (SF-36). Drug Treat 1999; 12: 102-106.

16) Huang MC, Hung CH, Chen CY, Hung WW, Liang HL. Factors associated with quality of life in patients with diabetic hypoglycaemia. J Clin Nurs 2020; 29: 1704-1711.

17) Rossi MC, Nicolucci A, Ozzello A, Gentile S, Aglialoro A, Chiambretti A, Baccetti F, Gentile FM, Romeo F, Lucisano G, Giorda CB; HYPOS-1 Study Group of AMD. Impact of severe and symptomatic hypoglycemia on quality of life and fear of hypoglycemia in type 1 and type 2 diabetes. Results of the Hypos-1 observational study. Nutr Metab Cardiovasc Dis 2019; 29: 736-743.

18) Zhang Y, Li S, Zou Y, Wu X, Bi Y, Zhang L, Yuan Y, Gong W, Hayter M. Fear of hypoglycemia in patients with type 1 and 2 diabetes: a systematic review. J Clin Nurs 2021; 30: 72-82.

19) Heller SR, Peyrot M, Oates SK, Taylor AD. Hypoglycemia in patient with type 2 diabetes treated with insulin: it can happen. BMJ Open Diab Res Care 2020; 8: e001194.

20) Yuksel M, Bektas H. Compliance with treatment and fear of hypoglycemia in patients with type 2 diabetes. J Clin Nurs 2021; 30: 1773-1786.

21) Krawczyk J, Duda-Sobczak A, Zozulińska-Ziołkiewicz D. Fear of hypoglycemia-from normality to pathology: diagnostic criteria and therapeutic directions. Clinical Diabetology 2020; 9: 487-492.

22) Jódar-Gimeno E, Álvarez-Guisasola F, Ávila-Lachica L, Palomares-Ortega R, Roldán-Suárez C, Lizán-Tudela L. Quality of life and fear for hypoglycemia in patients with type 2 diabetes mellitus. Calidad de vida y grado de preocupación por las hipoglucemias en pacientes con diabetes mellitus tipo 2. Rev Clin Esp (Barc) 2015; 215: 91-97.

23) Hapunda G, Abubakar A, Pouwer F, van de Vijver F. Correlates of fear of hypoglycemia among patients with type 1 and 2 diabetes mellitus in outpatient hospitals in Zambia. Int J Diabetes Dev Ctries 2020; 40: 619-626.

24) Li S, Fang L, Lee A, Hayter M, Zhang L, Bi Y, Wu X, Liu L, Zhang H, Yuan Y, Gong W, Zhang Y. The association between diabetes-related distress and fear of hypoglycemia in patients with type 2 diabetes mellitus: A cross-sectional descriptive study. Nurs Open 2021; 8: 1668-1677.

25) Emral R, Tetiker T, Sahin I, Sari R, Kaya A, Yetkin İ, Cil SU, Tütüncü NB; IO HAT investigator group. An international survey on hypoglycemia among insulin-treated type I and type II diabetes patients: Turkey cohort of the non-interventional IO HAT study. BMC Endocr Disord 2018; 18: 1-11.