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Research Article

Hypoglycemia Fear and Self-efficacy of Turkish Patients Receiving Insulin Therapy

Ozgul Erol, PhD, RN [1,*], Nuray Enc, PhD, RN [2]

[1] Department of Nursing, Faculty of Health Sciences, Trakya University, Edirne, Turkey
[2] Faculty of Nursing, İstanbul University, Istanbul, Turkey

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SUMMARY

Purpose: The purpose of this study was to determine hypoglycemia fear and self-efficacy levels of patients receiving insulin and the factors affecting these levels.
Method: In total, 345 diabetic patients who met the inclusion criteria participated in this descriptive, correlational study. Patients were invited to participate in the study during their regular visits to the diabetes outpatient clinic of Istanbul University, Istanbul Medicine Faculty. Data were collected using a patient-information form as well as the Hypoglycemia Fear Survey and Confidence in Diabetes Self-care Scale.
Results: It was found that patients who had type 1 diabetes, received intensive insulin therapy and experienced more frequent and severe hypoglycemia had more hypoglycemia worry and fear. It was also determined that patients who had type 1 diabetes and received intensive insulin therapy had higher self-efficacy levels than patients who had type 2 diabetes and received conventional therapy.
Conclusion: The effects of experiences of frequent and severe hypoglycemia in patients with diabetes emphasize the need for programs that support diabetes-specific self-efficacy and also guide and teach hypoglycemia prevention.

Introduction

Insulin is indispensable for patients with type 1 diabetes, and it becomes indispensable in time for patients with type 2 diabetes due to the progressive nature of pancreatic beta cell failure. However, paradoxically, although insulin treatment brings many benefits, it causes hypoglycemia, which is the most common and feared complication of diabetes (Akram, Bjergaard, Carstenen, Borch-Johnsen, & Thorsteinsson, 2006; Davis & Alonso, 2004; Donnely et al., 2005; Stotland, 2006). The effectiveness of insulin therapy in delaying the onset and reducing the progress of diabetes complications in patients with type 1 and type 2 diabetes was proven by the Diabetes Complications and Control Trial (DCCT Research Group, 1993) and the United Kingdom Prospective Diabetes Study (UKPDS, 1998), respectively. However, the DCCT demonstrated that strict glycemic control caused a three-fold increase in the number of hypoglycemic events in patients with type 1 diabetes, and the UKPDS established that the incidence of hypoglycemia increased significantly in patients with type 2 diabetes receiving insulin therapy.

Hypoglycemia is practically a part of life for individuals with type 1 diabetes and individuals with long-term type 2 diabetes (Brisco & Davis, 2006). It is also known as a main barrier to achieving glycemic goals (Brisco & Davis; Cox, Irvine, Gonder-Frederick, Nowacek, & Butterfield, 1987; Cryer, 2002; Cryer, Davis, & Shamoon, 2003; Gabriely & Shamoon, 2004; Murata, Duckworth, Shah, Wendel, & Hoffman, 2004; Wild et al., 2007; Yale et al., 2001). In particular, severe and recurrent hypoglycemia leads to fear of hypoglycemia, which negatively affects diabetes adherence and metabolic control. Patients with high hypoglycemia fear may engage in behaviors such as overeating, taking less insulin than required or limiting daily-life activities (e.g., exercising, driving, shopping, visiting friends) in order to avoid hypoglycemia. However, these types of coping strategies lead to poor metabolic control and increase the risk of health problems related to diabetes and psychosocial difficulties (Cox et al., 1987). The signs and symptoms of hypoglycemia differ from one individual to another (Davis & Alonso, 2004). Factors such as old age, long diagnosis period and the existence of complications impair hypoglycemia awareness. Studies have determined that 33% of individuals with diagnosis periods longer than 15 years have hypoglycemia unawareness (i.e., they are unaware of the signs and symptoms of hypoglycemia). This has been found to increase the risk of serious hypoglycemia, which increases hypoglycemia fear (Cox et al.; Davis & Alonso; Frier, 2008; Geddes, Wright, Zammit, Deary, & Frier, 2007). Kubiak, Hermanns, Schreckling, Kulzer and

* Correspondence to: Ozgul Erol, RN, PhD, Trakya University, Saglik Bilimleri Fakültesi, Aysekadin Kampüs, Edirne, Turkey.
E-mail address: ozgul_er@mynet.com (O. Erol).

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Haak (2006) found that 20–30% of individuals with type 1 diabetes had impaired hypoglycemia awareness. In particular, patients who experience sudden hypoglycemic attacks worry about losing control, experiencing hypoglycemia while alone or sleeping or making a mistake or having an accident during an attack (Cox & Gonder-Frederick, 1992; Frier, 2008). Because they might not have time to treat their hypoglycemia and might lose consciousness suddenly, hypoglycemia has the potential to be life threatening.

Self-efficacy reflects individuals' ability to make behavioral changes in order to adapt to chronic conditions and improve self-care abilities (Van der Ven, Weinger, Pouwer, Ader, & Van der Ploeg, 2003). Sigurdardottir (2005) states that self-efficacy is a powerful predictor of a person's perceived self-care. Studies of patients with type 2 diabetes demonstrated that greater self-efficacy predicted better nutrition and medication management, more frequent self-monitoring of blood glucose and enhanced physical activity (Dutton et al., 2009; King et al., 2010). While higher levels of self-efficacy have been seen as an indicator of better diabetes control, lower levels have been seen as an indicator of worse diabetes control (Glasgow, Tooberth, & Gilette, 2001). Wu, Lee, Liang, Wang and Tung (2011) determined that a program aimed at improving the self-efficacy of patients with type 2 diabetes was effective in terms of short-term self-management. A research suggested that patients who reported hypoglycemia fear might actively attempt to avoid hypoglycemia by maintaining higher than optimal glucose levels (Irvine, Cox, & Gonder-Frederick, 1992). Experiencing frequent or severe hypoglycemic attacks that lead to unconsciousness might be related to lower self-efficacy levels regarding self-care behaviors. Thus, this study aimed to determine hypoglycemia fear and self-efficacy levels of patients receiving insulin, and the factors affecting these levels.

Method

Setting and sample

The study sample consisted of 345 patients who were using insulin and admitted to the Diabetes Outpatient Clinic of the Department of Endocrinology and Metabolism Disease at Istanbul Medical Faculty, Istanbul University. Each day, approximately 80 patients attend this outpatient clinic, which is open 3 days a week. However, due to various reasons (e.g., meetings, congress, holidays), the outpatient clinic is closed for 4 weeks of the year. Thus, approximately 10,560 patients with diabetes attend this outpatient clinic in a year. As the general control period of the group was three months, 2,500-3,000 patients with diabetes were being cared for and controlled in a year. With a power analysis using a 95% confidence interval (CI), 50% hypoglycemia fear and self-efficacy level sample size was determined to be 333.

Data were collected between October 2007 and May 2008. During this period, the researchers reached 378 patients that met the inclusion criteria. However, because of incomplete data, 33 of the forms were not included in the study, thus bringing the total number to 345. Face-to-face interviews were conducted with the patients who were waiting for their appointments with the physician, diabetes nurse or dietitian. Suitable patients were invited to a private room before or after their appointment. Patients who were able to fill out the forms filled the forms themselves and asked questions when they needed; for those who wished to participate the study but had vision problems or were too weak to read and write, a researcher verbally presented the questions and completed the forms according to the patient's responses. Each interview lasted for 20 minutes.

Inclusion criteria were as follows: being 18 years or older, having a diagnosis period of at least 1 year, having type 1 or type 2 diabetes, using insulin, literate, able to fill out the forms and willingness to participate in the study. Patients who had psychiatric disorders defined in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (American Psychiatric Association, 1994) criteria were not included.

Instruments

The patient information form developed by the researchers included both sociodemographic (e.g., age, income level, education, employment status) and diabetes-related (e.g., diabetes type, diagnosis year, medication, complications) questions.

For the Hypoglycemia Fear Survey (HFS; Cox et al., 1987) and the Confidence in Diabetes Self-care Scale (CIDS; Van der Ven et al., 2003), the original developers of the instruments were contacted and asked for permission to translate these scales into Turkish. The above instruments were translated into Turkish and back-translated into English. The original and back-translated English versions of the instruments were assessed by the researchers and a team composed of professionals working closely with patients with diabetes, including clinical and academic nurses, physicians and psychologists. When semantic differences between the two instruments were found, the Turkish versions of the instruments were revised and retranslated. After repeating the process until the instruments were deemed acceptable, readability was tested with five patients with diabetes mellitus before the final versions of the instruments were considered ready to use.

HFS, developed by Cox et al. (1987), is a 33-item questionnaire with two subscales that measure (a) behaviors aimed at avoiding hypoglycemia and its negative consequences and (b) worries about hypoglycemia and its negative consequences. Responses are made on a 5-point Likert scale where 0 means *never* and 4 means *always*. Both subscales were used in this study, and higher scores indicated increased fear of hypoglycemia. Internal consistency reliability (Cronbach's alpha) for the behavior subscale, worry subscale and total HFS was found to be .77, .91 and .90, respectively.

CIDS, developed by Van der Ven et al. (2003), is a 20-item scale that assesses diabetes-specific self-efficacy and the perceived ability to perform diabetes self-care tasks. Each item is rated on a 5-point Likert scale ranging from 1 (*No, I am sure I cannot*) to 5 (*Yes, I am sure I can*). A total CIDS score is calculated by summing all item scores, with higher scores indicating higher self-efficacy. Internal consistency reliability for this scale was found to be .82.

The metabolic control of the patients was determined by looking at the most recent records of the parameters (e.g., fasting/postprandial glucose, glycosylated hemoglobin, chronic complications and lipid levels). Insulin regimens were reported as conventional therapy for patients who received insulin one or two times a day, intensive therapy for patients who received insulin three or more times a day.

Ethical considerations

In order to conduct this research, permission had to be obtained from the Department of Endocrinology and Metabolism Disease of Istanbul University, Istanbul Medical Faculty. Ethical approval was granted by the Ethics Committee of Istanbul University, Istanbul Medical Faculty. Patients who met the inclusion criteria were invited to participate in the study. Following this, the aim of the study was explained, and verbal consent was obtained.

Data analysis

Data analysis was performed using SPSS (version 11.5; SPSS Inc., Chicago, IL, USA). Descriptive statistics, means, medians, frequencies

and percentages were used to show the distribution of personal characteristics, diabetes-related characteristics and scale scores. Because the data were not normally distributed, nonparametric tests were selected. The Mann-Whitney *U* and Kruskal–Wallis tests and Spearman's correlations were used to assess the factors affecting the hypoglycemia fear and self-efficacy levels of patients. A *p* less than .05 was considered statistically significant.

Results

Sociodemographic characteristics

The mean age of the group was 51.71 ± 14.12 years (range: 19–78). Of all participants, 59.7% ($n = 206$) were female, 69.9% ($n = 241$) were married and 40.9% ($n = 141$) were primary-school graduates. Nearly half of the sample had low income (46.7%, $n = 161$), and 39.4% ($n = 136$) were homemakers (Table 1).

Diabetes-related characteristics

The mean diagnosis period of the patients was 13.1 ± 7.55 years (range: 1–38), and the mean insulin-usage period was 7.21 ± 6.26 years (range: 1–38). Most of the group (72.5%, $n = 250$) had type 2 diabetes, 10.1% ($n = 35$) of the patients were hospitalized because of diabetes or its complications and 44.3% ($n = 153$) of them were using oral antidiabetic agents (OADs) in addition to insulin therapy. More than half of the group (58%, $n = 200$) were being treated with intensive insulin therapy (3 or more injections/day), and 61.7% ($n = 213$) of the patients were using antihypertensives. Of all participants, 53.0% ($n = 183$) carried out medical controls at 6-month intervals. Moreover, 66.4% ($n = 229$) of the participants reported that they had adequate education on diabetes, 70.7% ($n = 244$) mentioned that they had education on hypoglycemia and 62.9% ($n = 217$) stated that this education was adequate (Table 2).

Patients' mean fasting blood glucose was 150.98 ± 57.53 mg/dL (range: 35–433), postprandial blood glucose was 202.92 ± 72.30 mg/dL (range: 55–480) and hemoglobin A1c was 7.98 ± 1.47% (range: 5.10–13.70). Most patients (74.2%, $n = 256$) had one or more chronic complication, including hypertension (62.3%), retinopathy (31.0%) and neuropathy (29.3%).

It was determined that 71.3% ($n = 246$) of the group had hypoglycemia with symptoms such as sweating, weakness, tension, trembling and hunger in the last month, and 26.4% ($n = 91$) reported that they had experienced severe hypoglycemia that led to unconsciousness or treatment. According to patients' reports, without any signs or symptoms, 22.5% ($n = 78$) of the group found their blood glucose levels to be under 3.8 mmol/L, and 40% ($n = 138$) of the group found their blood glucose levels to be above 13 mmol/L.

Hypoglycemia fear and factors affecting hypoglycemia fear

Age, gender, marital status and occupation were the important variables found to affect hypoglycemia fear. As age increased, hypoglycemia fear ($r_s = -.24$, $p = <.001$), hypoglycemia worry ($r_s = -.20$, $p = <.001$) and the frequency of behaviors performed to avoid hypoglycemia ($r_s = -.25$, $p < .001$) decreased (Table 3).

Women experienced more hypoglycemia worry than men did ($z_{MWU} = -2.50$, $p = .012$). Single patients had higher levels of hypoglycemia fear ($x^2_{KW} = 11.28$, $p = .004$) and hypoglycemia worry ($x^2_{KW} = 7.53$, $p = .023$) and performed behaviors to avoid hypoglycemia more frequently ($x^2_{KW} = 11.25$, $p = .004$) than did their married counterparts. Participants who were homemakers also performed behaviors to avoid hypoglycemia more frequently than those who were retired ($x^2_{KW} = 16.53$, $p = 0.001$). No significant relationship was found between hypoglycemia fear and education or income level (Table 1).

Type of diabetes, period of diagnosis and insulin usage, insulin treatment method, usage of OADs with insulin therapy and the existence of a chronic complication were important diabetes-related variables that were found to affect hypoglycemia fear. It was determined that patients who had type 1 diabetes had more hypoglycemia fear ($z_{mwu} = -6.69$, $p < .001$) and worry ($z_{mwu} = -5.53$, $p < .001$) and performed avoidance behaviors more frequently ($z_{mwu} = -6.86$, $p = <.001$) than patients with type 2 diabetes did. In addition, patients receiving intensive insulin therapy

Table 1
Comparison of Patients' Demographic Characteristics and Hypoglycemia Fear and Self-efficacy ($N = 345$).

	n	%	HFS-B		HFS-W		HFS-T		CIDS	
			z_{MWU}/X^2_{KW}	*p*	z_{MWU}/X^2_{KW}	*p*	z_{MWU}/X^2_{KW}	*p*	z_{MWU}/X^2_{KW}	*p*
Gender										
Females	206	59.7	−1.23	.215	−2.50	.012	−1.93	.050	−0.71	0.47
Males	139	40.3								
Marital status										
Married	241	69.9	11.25	.004	7.53	.023	11.28	.004	25.64	< .001
Single	46	13.3								
Widowed	58	16.8								
Income level										
Low	161	46.7	4.38	.111	0.08	.956	1.19	.549	18.03	< .001
Moderate	145	42.0								
High	39	11.3								
Education										
Primary school	141	40.9	2.52	.471	2.29	.514	1.85	.603	46.44	< .001
Middle school	42	12.2								
High school	72	20.9								
University	90	26.1								
Occupation										
Housewife	136	39.4	16.53	.001	18.68	< .001	20.95	< .001	13.22	.004
Retired	129	37.4								
Government	38	11.1								
Others	42	12.1								

Notes. z_{MWU} = Mann-Whitney *U*, X^2_{KW}= Chi-square Kruskall-Wallis; HFS-B = Hypoglycemia Fear Behavior Subscale, HFS-W = Hypoglycemia Fear Worry Subscale; HFS-T = Hypoglcemia Fear Total Scale; CIDS = Confidence in Diabetes Self-care Scale.

Table 2
Comparison of Patients' Diabetes Related Characteristics and Hypoglycemia Fear and Self-efficacy ($N = 345$).

	n	%	HFS-B		HFS-W		HFS-T		CIDS	
			z_{MWU}	*p*	z_{MWU}	*p*	z_{MWU}	*p*	z_{MWU}	*p*
Type of diabetes										
Type 1	95	27.5	−6.86	<.001	−5.53	<.001	−6.69	<.001	−3.97	<.001
Type 2	250	72.5								
Hospitalization history due to diabetes or diabetes related complications										
Yes	35	10.1	−2.78	.005	−2.76	.006	−3.22	.001	−.72	.467
No	310	89.9								
Use of OAD addition to insulin therapy										
Yes	153	44.3	−5.67	<.001	−5.39	<.001	−6.27	<.001	−1.47	.141
No	192	55.7								
Type of insulin therapy										
Conventional	145	42.0	−6.73	<.001	−5.18	<.001	−6.55	<.001	−2.57	.010
Intensive	200	58.0								
Having enough education about diabetes										
Yes	229	66.4	−0.28	.780	−0.22	.821	−0.26	.792	−3.56	<.001
No	116	33.6								
Having enough education about hypoglycemia										
Yes	217	62.9	−0.87	.383	−1.09	.275	−0.96	.332	−3.18	.001
No	128	37.1								

Notes. z_{MWU} = Mann-Whitney *U*; HFS-B = Hypoglycemia Fear Behavior Subscale; HFS-W = Hypoglycemia Fear Worry Subscale; HFS-T = Hypoglcemia Fear Total Scale; CIDS = Confidence in Diabetes Self-care Scale; OAD = oral antidiabetic agent.

had more hypoglycemia fear ($z_{mwu} = -6.55$, $p < .001$) and worry ($z_{mwu} = -5.18$, $p = <.001$) and performed avoidance behaviors more frequently ($z_{mwu} = -6.73$, $p < .001$) than patients receiving conventional therapy did (Table 2). It was found that as the diagnosis period increased, worries related to hypoglycemia increased as well ($r_s = .11$, $p = .038$). Moreover, as the insulin-usage period increased, hypoglycemia fear ($r_s = .30$, $p < .001$) and worry ($r_s = .28$, $p = <.001$) and frequency of hypoglycemia-avoidance behaviors ($r_s = .27$, $p = <.001$) increased (Table 3).

Patients who were receiving only insulin therapy had more hypoglycemia fear ($z_{mwu} = -6.27$, $p = <.001$) and worry ($z_{mwu} = -5.39$, $p = <.001$) and more frequent avoidance behaviors ($z_{mwu} = -5.67$, $p = <.001$) than patients who were receiving OADs with insulin therapy did. Thus, this study demonstrates that having type 1 diabetes, experiencing frequent and severe hypoglycemia and receiving insulin therapy (especially intensive insulin therapy) are important variables associated with hypoglycemia fear.

Diabetes-related self-efficacy and factors affecting self-efficacy

As age increased, the diabetes-specific self-efficacy levels of the patients decreased. Patients who were single, had high levels of income and high scores of self-perceived health had higher diabetes-specific self-efficacy scores. However, patients who were homemakers and who were primary-school graduates had lower diabetes-specific self-efficacy scores. It was determined that participants who had type 1 diabetes, were receiving intensive therapy, had diabetes education and reported that they had adequate education about hypoglycemia also had higher diabetes-specific self-efficacy scores. Patients who had higher fasting and postprandial blood glucose levels had lower diabetes-specific self-efficacy scores (Tables 1, 2 and 3).

As hypoglycemia fear increased, worry and avoidance behaviors related to hypoglycemia increased as well. No significant relationship was found between hypoglycemia fear and worry and the performance of avoidance behaviors and diabetes-specific self-efficacy levels (Table 4).

Discussion

Hypoglycemia is often seen as a main barrier to diabetes control (Cryer, 2002; Cryer et al., 2003; Gabriely & Shamoon, 2004). As insulin is indispensable for patients with type 1 diabetes, these patients have a higher risk of hypoglycemia than those with type 2 diabetes do. Many studies have demonstrated that hypoglycemia especially severe hypoglycemia is more frequently seen in patients with type 1 diabetes (Donnely et al., 2005; Fanelli, Porcellati, Pampanelli, & Bolli, 2004; Leese et al., 2003). In this study, patients with type 1 diabetes carried out behaviors to avoid hypoglycemia more frequently and exhibited more worry and fear related to hypoglycemia. Myers, Boyer, Herbert, Barakat and Scheiner (2007) determined that patients with type 1 diabetes

Table 3
Relationship Between Frequency of Hypoglycemia, Age, Diagnosis Period, Insulin Usage Period and Hypoglycemia Fear and Self-efficacy of Patients ($N = 345$).

	HFS-B		HFS-W		HFS-T		CIDS	
	r_s	*p*	r_s	*p*	r_s	*p*	r_s	*p*
Frequency of hypoglycemia in the last month	.350	<.001	.334	<.001	.372	<.001	.050	.429
Frequency of severe hypoglycemia in the last year[a]	.390	<.001	.395	<.001	.403	<.001	−.039	.535
Age	−.254	<.001	−.209	<.001	−.249	<.001	−.286	<.001
Diagnosis period	.075	.166	.112	.038	.100	.064	−.026	.625
Insulin usage period	.273	<.001	.283	<.001	.305	<.001	.082	.127

Notes. r_s = Spearman's rho correlations; HFS-B = Hypoglycemia Fear- Behaviour Subscale; HFS-W = Hypoglycemia Fear-Worry Subscale; HFS-T = Hypoglcemia Fear Total Scale; CIDS = Confidence in Diabetes Self-Care Scale.

[a] Severe hypoglycemia refers to that which leads to unconsciousness or requiring help for recovery.

Table 4
Relationship Between Hypoglycemia Avoidance Behaviors, Hypoglycemia Worry, Hypoglcemia Fear and Self-efficacy ($N = 345$).

	HFS-B subgroup score		HFS-W subgroup score		HFS-T score		CIDS score	
	r_s	p	r_s	p	r_s	p	r_s	p
HFS-B subgroup score	–	–	.666	<.001	.867	<.001	.075	.163
HFS-W subgroup score	.666	<.001	–	–	.937	<.001	.005	.930
HFS-T score	.867	<.001	.937	<.001	–	–	.030	.574
CIDS score	.075	.163	.005	.930	.030	.574	–	–

Notes. r_s = Spearman's rho correlations; HFS-B = Hypoglycemia Fear Behavior Subscale; HFS-W = Hypoglycemia Fear Worry Subscale; HFS-T = Hypoglcemia Fear Total Scale; CIDS = Confidence in Diabetes Self-care Scale.

perceived hypoglycemia as a life-threatening event and experienced signs and symptoms of post-traumatic stress disorder after severe hypoglycemia attacks. Similar to these results, other studies have shown that patients with type 1 diabetes have more hypoglycemia fear and worry than patients with type 2 diabetes (Polonsky, Davis, Jacobson, & Anderson, 1992; Shiu & Wong, 2004). Patients using oral antidiabetic agents in addition to insulin therapy have also been found to perform behaviors to avoid hypoglycemia less frequently and to have less worry and fear related to hypoglycemia. These patients had type 2 diabetes, and as they did not experience frequent hypoglycemia attacks, they did not feel much worry or fear. A study conducted by the United Kingdom Hypoglycaemia Study Group (2007) stated that the hypoglycemia risk of patients with type 2 diabetes increases after 5 years of insulin usage.

It has been shown that intensive insulin therapy is the most suitable way for patients with type 1 or type 2 diabetes and low insulin reserves to prevent or delay diabetes-related complications (DCCT, 1993; UKPDS, 1998). However, it has also been shown that intensive therapy increases severe hypoglycemia attacks by 2–3 times (DCCT). This study also demonstrated that patients receiving intensive therapy performed hypoglycemia avoidance behaviors more frequently and experienced more worry and fear related to hypoglycemia than patients receiving conventional insulin therapy did.

Most of the patients reported that they had experienced hypoglycemia signs and symptoms in the last month. As the frequency of hypoglycemia increased, behaviors to avoid hypoglycemia as well as levels of worry and fear related to hypoglycemia increased as well. Similar to this finding, Lundkvist, Berne, Bolinder, and Jönsson (2005) also found a positive relationship between frequency of hypoglycemia and worry and fear related to hypoglycemia. Moreover, Stargardt, Gonder-Frederick, Krobot and Alexander (2009) stated that as the frequency and severity of hypoglycemia increased, patients' fear of hypoglycemia increased as well. Çelik (2002) reported that as the frequency of hypoglyceemia decreased, levels of depression and anxiety decreased, while well-being increased. In this study, more than a quarter of the patients mentioned that they had experienced severe hypoglycemia that led to unconsciousness or treatment. It has been reported that 30% of patients with type 1 diabetes experienced severe hypoglycemia in Northern European countries (Leese et al., 2003). Another study reported that 27.2% of patients with type 1 diabetes and 14.3% of patients with type 2 diabetes experience severe hypoglycemic attacks within a year time frame (Leiter et al., 2005). Studies have determined that previous experiences related to severe hypoglycemia affect the development of hypoglycemia fear (Ter Braak et al., 2000; Wild et al., 2007). This study showed that as the frequency of severe hypoglycemia increased, behaviors aimed at avoiding hypoglycemia, and worry and fear related to hypoglycemia increased as well. In line with this result, Polonsky et al. (1992) found that patients with severe hypoglycemia exhibited more hypoglycemia worries.

Diabetes is a chronic health problem demanding complex treatment and care. The goal of diabetes treatment and care is to achieve glycemic control and to prevent acute and chronic complications of diabetes. Diabetes care is an important and comprehensive concept, including a balance between medical therapy, nutrition, exercise and blood glucose monitoring. The outcome of diabetes treatment is highly dependent on whether patients have healthy lifestyles and the on-going motivation to adhere to diabetes treatment. Of all chronic diseases, diabetes requires the most number of behavioral changes in order to succeed in management (Cox & Gonder-Frederick, 1992). When a patient receiving insulin therapy makes the necessary lifestyle changes and complies with these basic components, her/his hypoglycemia frequency decreases. As intensive insulin therapy requires three or more daily injections, patients receiving intensive insulin therapy have to make more significant lifestyle changes in order to adhere to their insulin regimens. Otherwise, they can experience frequent or severe hypoglycemia attacks, which can negatively impact their lives and create psychological problems such as hypoglycemia fear. Therefore, as was expected, diabetes-specific self-efficacy levels of patients receiving intensive insulin therapy were found to be higher than those of patients receiving conventional therapy in this study.

It has been determined that as age increased, the diabetes-specific self-efficacy levels of the patients decreased. This may be because as age increases, the burden of living with a chronic condition such as diabetes increases as well. Moreover, patients' motivation to adhere to diabetes treatment and maintain a healthy lifestyle could decrease over time. This study found that participants with higher levels of education had higher diabetes-specific self-efficacy scores. Other studies have also found a positive relationship between education level and self-efficacy (Meers et al., 1996; Mollaoğlu & Bağ, 2009; Qiao & Shiu, 2004). This may be related to the fact that higher education brings higher levels of knowledge of, awareness of and sensitivity to health problems and better economic and social conditions. Economic condition is an important factor that significantly affects health status. The findings of this study showed that patients with better economic conditions had higher diabetes-specific self-efficacy scores. This is consistent with a study examining the factors affecting health behaviors, which showed that participants with higher levels of income had better self-care and self-efficacy levels (Callaghan, 2006). Lee, Ahn and Kim (2009) also determined that patients with higher incomes and/or education were more likely to visit specialists, report better self-care practices (including higher self-efficacy) and control blood glucose better than those who received generalist care.

Van der Ven, Weinger, Pouwer, Ader, & Van der Ploeg (2003) determined that as the diabetes-specific self-efficacy levels of patients with type 1 diabetes increased, stress related to diabetes, hypoglycemia fear, anxiety and depression decreased. However, in this study, no significant relationship was found between hypoglycemia fear and diabetes-specific self-efficacy. This might be because that study group consisted of patients with both type 1 and type 2 diabetes. As patients with type 2 diabetes experience less frequent hypoglycemia attacks, they report lower hypoglycemia fear than patients with type 1 diabetes. In addition, they generally begin to receive insulin therapy when they are older, and they might not consider their health condition to be as serious as patients with type 1 diabetes. Therefore, they might not place much importance on their diabetes care. Moreover, this study determined

that patients with type 1 diabetes had higher diabetes-specific self-efficacy levels than patients with type 2 diabetes. A qualitative study evaluating the self-care decision processes of patients with type 1 diabetes determined that patients with long diagnosis periods also had increased experiences, which led them to make more effective decisions and improve individualized strategies by interpreting the signs from their bodies (Paterson & Sloan, 1994).

Patients' active participation in diabetes care is one of the keys to successful self-management. It is believed that improving patients' self-efficacy will improve self-management (Sarkar, Fisher, & Schillinger, 2006). Nurses have the great responsibility of building up a patient's confidence to manage a healthy lifestyle that leads to better diabetes control. For example, teaching patients about balanced diets, daily exercise and evaluating their behaviors and diabetes control can help them maintain newly acquired behaviors. Patients must also evaluate the existing conditions and gain the necessary skills to make proper decisions about their diabetes self-management activities.

Conclusion

This study revealed that experiencing severe and recurrent hypoglycemia attacks leads to hypoglycemia worry and hypoglycemia avoidance behaviors, which are directly related to hypoglycemic fear. Although this study found no relationship between patients' hypoglycemia fear and self-efficacy levels, it is evident that hypoglycemia worry and hypoglycemia avoidance behaviors negatively affect diabetes control. Therefore, nurses should ask about and evaluate patients' hypoglycemia experiences (e.g., frequency, etiology, avoidance behaviors, treatment) at every appointment. They should also ask patients to write these experiences in a daily diary (including date, time, signs and symptoms, treatment and potential causes). Hypoglycemia fear levels should be evaluated, and patients with higher levels of hypoglycemia fear should be monitored closely. If necessary, they should be supported by liaison psychiatrists. Patients' hypoglycemia awareness should be evaluated periodically, and programs aimed at improving awareness should be created. Patients with a higher risk of severe hypoglycemia and their families should be educated about the prevention and treatment of hypoglycemia. Diabetes-specific self-efficacy scales provide knowledge about patients' self-care capabilities and self-confidence; they are beneficial during patient assessments and while planning individualized care. Patients with diabetes need lifelong education, support and empowerment—all of which can be provided by nurses.

Limitations

Limitations of the current study include the fact that this was a descriptive study, and causality could not be established. It was carried out in a single diabetes centre. Although the Diabetes Outpatient Clinic of the Istanbul Medical Faculty at Istanbul University receives patients from various cities, the results cannot be generalized to all diabetes patients. Moreover, data were obtained by face-to-face conversations with the patients or by the patients filling the forms out by themselves. Therefore, the reliability of the data is limited by the self-reports of the patients.

Conflict of interest

The authors declare no conflict of interest.

References

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Akram, K., Bjergaard, U., Carstenen, B., Borch-Johnsen, K., & Thorsteinsson, B. (2006). Frequency and risk factors of severe hypoglycemia in insulin-treated type 2 diabetes: a cross-sectional survey. *Diabetic Medicine, 23*, 750–756.

Brisco, V. J., & Davis, S. N. (2006). Hypoglycaemia in type 1 and type 2 diabetes. Physiology, pathophysiology, and management. *Clinical Diabetes, 24*, 115–121.

Callaghan, D. (2006). The influence of basic conditioning factors on healthy behaviors, self-efficacy, and self-care in adults. *Journal of Holistic Nursing, 24*, 178–185.

Çelik, S. G. (2002). Tip 2 diyabetli hastaların bakıma ve tedaviye yönelik tutumlarının ve iyilik hallerinin belirlenmesi [Determination of attitudes to diabetes care and well-being of patients with type 2 diabetes]. (Unpublished master's dissertation, İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü [Institute of Health Sciences, Istanbul University], Yüksek Lisans Tezi, Turkey.

Cryer, P. E. (2002). Hypoglycemia: the limiting factor in the glycemic management of type 1 and type 2 diabetes. *Diabetologia, 45*, 937–948.

Cryer, P. E., Davis, S. N., & Shamoon, H. (2003). Hypoglycemia in diabetes. *Diabetes Care, 26*, 1902–1912.

Cox, D. J., Irvine, A., Gonder-Frederick, L., Nowacek, G., & Butterfield, J. (1987). Fear of hypoglycemia: quantification, validation, and utilization. *Diabetes Care, 10*, 617–621.

Cox, D. J., & Gonder-Frederick, L. (1992). Major developments in behavioral diabetes research. *Journal of Consulting and Clinical Psychology, 60*, 628–638.

Davis, S., & Alonso, M. D. (2004). Hypoglycemia as a barrier to glycemic control. *Journal of Diabetes and Its Complications, 18*, 60–88.

Diabetes Control and Complications Trial Research Group. (1993). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *New England Journal of Medicine, 329*, 977–986.

Donnely, L. A., Morris, A. D., Frier, B. M., Ellis, J. D., Donnan, P. T., Durrant, R., et al. (2005). Frequency and predictors of hypoglycemia in type 1 and insulin-treated type 2 diabetes: a population-based study. *Diabetic Medicine, 22*, 749–755.

Dutton, G. R., Tan, F., Provost, B. C., Sorenson, J. L., Allen, B., & Smith, D. (2009). Relationship between self-efficacy and physical activity among patients with type 2 diabetes. *Journal of Behavioral Medicine, 32*, 270–277.

Fanelli, C. G., Porcellati, F., Pampanelli, S., & Bolli, G. B. (2004). Insulin therapy and hypoglycemia: the size of the problem. *Diabetes Metabolism and Research, 20*(Suppl. 2), 32–42.

Frier, B. M. (2008). How hypoglycemia can affect the life of a person with diabetes. *Diabetes Metabolism and Research, 24*, 87–92.

Gabriely, I., & Shamoon, H. (2004). Hypoglycemia in diabetes. *Cleveland Clinic Journal of Medicine, 71*, 335–342.

Geddes, J., Wright, R. J., Zammit, N. N., Deary, I. J., & Frier, B. M. (2007). An evaluation of methods of assessing impaired awareness of hypoglycaemia in type 1 diabetes. *Diabetes Care, 30*, 1868–1870.

Glasgow, R. E., Tooberth, D. J., & Gilette, C. D. (2001). Psychosocial barriers to diabetes self-management and quality of life. *Diabetes Spectrum, 14*, 33–41.

Irvine, A. A., Cox, D., & Gonder-Frederick, L. (1992). Fear of hypoglycemia: relationship to physical and psychological symptoms in patients with insulin-dependent diabetes mellitus. *Health Psychology, 11*, 135–138.

King, D. K., Glasgow, R. E., Toobert, D. J., Strycker, L. A., Estabrooks, P. A., Osuna, D., et al. (2010). Self-efficacy, problem-solving and social-environmental support are associated with diabetes self-management behaviors. *Diabetes Care, 33*, 751–753.

Kubiak, T., Hermanns, N., Schreckling, H. J., Kulzer, B., & Haak, T. (2006). Evaluation of a self-management-based patient education programme for the treatment and prevention of hypoglycaemia-related problems in type 1 diabetes. *Patient Education and Counselling, 60*, 228–234.

Lee, H., Ahn, S., & Kim, Y. (2009). Self-care, self-efficacy, and glycemic control of Koreans with diabetes mellitus. *Asian Nursing Research, 3*, 139–146.

Leese, G. P., Wang, J., Broomhall, J., Kelly, P., Marsden, A., & Morrison, W. (2003). Frequency of severe hypoglycemia requiring emergency treatment in type 1 and type 2 diabetes. *Diabetes Care, 26*, 1176–1180.

Leiter, L. A., Yale, J. F., Chiasson, J. L., Harris, S. B., Kleinstiver, P., & Sauril, L. (2005). Assessment of the impact of fear of hypoglycemic episodes on glycemic and hypoglycemia management. *Canadian Journal of Diabetes, 29*, 186–192.

Lundkvist, J., Berne, C., Bolinder, B., & Jönsson, L. (2005). The economic and quality of life impact of hypoglycemia. *European Health Economics, 50*, 197–202.

Mollaoğlu, M., & Bağ, E. (2009). Hemodiyaliz uygulanan hastalarda öz yeterlilik ve etkileyen faktörler. [[Self-efficacy and the factors affecting self-efficacy in hemodialysis patients]]. *Journal of Istanbul University Medical Faculty, 72*(2), 37–42, İstanbul Üniversitesi Tıp Fakültesi Dergisi.

Meers, C., Singer, M. A., Toffelmire, E. B., Hopman, W., McMurray, M., & Morton, A. R. (1996). Self-delivery of hemodialysis care: a therapy in itself. *American Journal of Kidney Disease, 27*, 844–847.

Murata, G. H., Duckworth, W. C., Shah, J. H., Wendel, C. S., & Hoffman, R. M. (2004). Factors affecting hypoglycemia awareness in insulin-treated type 2 diabetes: the Diabetes Outcomes in Veterans Study. *Diabetes Research and Clinical Practice, 65*, 61–67.

Myers, V. H., Boyer, B. A., Herbert, J. D., Barakat, L. P., & Scheiner, G. (2007). Fear of hypoglycemia and self-reported post-traumatic stress in adults with type1 diabetes treated by intensive regimens. *Journal of Clinical Psychology in Medical Settings, 14*, 11–21.

Paterson, B. L., & Sloan, J. (1994). A phenomenological study of the decision-making experience of individuals with long-standing diabetes. *Canadian Journal of Diabetes Care, 18*(4), 10–19.

Polonsky, W. H., Davis, C. L., Jacobson, D. A., & Anderson, B. J. (1992). Correlates of hypoglycemic fear in type 1 and type 2 diabetes mellitus. *Health Psychology, 11*, 199–202.

Qiao, J., & Shiu, A. (2004). Diabetes self-efficacy and self-care behavior of Chinese patients living in Shanghai. *Journal of Clinical Nursing, 13*, 771–772. doi:10.1111/j.1365-2702.2004.00918.x.

Sarkar, U., Fisher, L., & Schillinger, D. (2006). Is self-efficacy associated with diabetes self-management across race/ethnicity and health literacy? *Diabetes Care, 29*, 823–829.

Shiu, A. T. Y., & Wong, R. Y. M. (2004). Reliability and validity of the Chinese version of the worry scale. *Public Health Nursing, 21*, 257–265.

Sigurdardottir, A. K. (2005). Self-care in diabetes: model of factors affecting self-care. *Journal of Clinical Nursing, 14*, 301–314.

Stargardt, T., Gonder-Frederick, L., Krobot, K. J., & Alexander, C. M. (2009). Fear of hypoglycemia: defining a minimum clinically important difference in patients with type 2 diabetes. *Health Quality of Life Outcomes, 7*, 91. doi:10.1186/1477-7525-7-91.

Stotland, N. L. (2006). Overcoming psychological barriers in insulin therapy. *Insulin, Excerpta Medica, 1*, 38–45.

Ter Braak, E. W. M. T., Appleman, A. M. M. F., Van De Laak, M. F., Stolk, R. P., Van Haeften, T. W., & Erkelens, D. W. (2000). Clinical characteristics of type 1 diabetic patients with and without severe hypoglycemia. *Diabetes Care, 23*, 1467–1471.

United Kingdom Diabetes Prospective Study (UKPDS) Group. (1998). Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet, 352*, 837–853.

United Kingdom Hypoglycaemia Study Group. (2007). Risk of hypoglycaemia in type 1 and 2 diabetes: effects of treatment modalities and their duration. *Diabetologia, 50*, 1140–1147.

Van der Ven, N. C. W., Weinger, K., Yi, J., Pouwer, F., Ader, H., & Van der Ploeg, H. M. (2003). The confidence in diabetes self-care scale. *Diabetes Care, 26*, 713–718.

Wild, D., Von Maltzahn, R., Brohan, E., Christensen, T., Clauson, P., & Gonder-Frederick, L. A. (2007). Critical review of the literature on fear of hypoglycemia in diabetes. *Patient Education and Counselling, 68*, 10–15.

Wu, S. F. V., Lee, M. C., Liang, S. Y., Wang, T. J., & Tung, H. H. (2011). Effectiveness of a self-efficacy program for persons with diabetes: a randomized controlled trial. *Nursing & Health Sciences, 13*, 335–343.

Yale, J. F., Begg, I., Gerstein, H., Houldan, R., Jones, H., & Maheux, P. (2001). Canadian diabetes association clinical practice guidelines for the prevention and management of hypoglycemia in diabetes. *Canadian Journal of Diabetes, 26*, 22–35.