Hypoglycemia Fear and Psychological Resilience: Effects on Disease Acceptance in Type II Diabetes
Hipoglisemi Korkusu ve Psikolojik Dayanıklılık: Tip II Diyabette Hastalığı Kabul Etme Üzerine Etkileri

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Abstract

Aim: This study aimed to evaluate the effects of fear of hypoglycemia and psychological resilience on disease acceptance and action in individuals with type II diabetes.

Methods: This research was conducted as a cross-sectional study online from January 1 to June 30, 2023, involving 105 participants. Data were collected using a Personal Information Form, the Fear of Hypoglycemia Scale (FOH), the Brief Resilience Scale (BRS), and the Acceptance and Action Diabetes Questionnaire (AADQ). Ethical approval was obtained for the study.

Results: The mean age of participants was 49.71±16.21 years, with 53.3% being female. Among the participants, 49.5% used oral diabetic medications, 67.6% had regular medical checkups, and 54.3% had at least one additional chronic condition. Neuropathy was reported by 24.8% of the participants. The mean scores were: FOH 27.93±22.16, BRS 16.63±4.14, and AADQ 45.21±10.98. Multiple regression analysis indicated that factors such as income being less than expenses (p=0.064), regular doctor checkups (p=0.001), and worries about hypoglycemia (p=0.001) predicted 22.6% of the variance in AADQ scores.

Conclusion: The study found a weak, negative relationship between fear of hypoglycemia, psychological resilience, and disease acceptance in individuals with type II diabetes. These findings underscore the need to assess psychological factors during routine checkups to enhance disease management.

Key Words: Hypoglycemia, Resilience, Diabetes

Özet

Amaç: Bu çalışma, hipoglisemi korkusu ve psikolojik dayanıklılığın Tip II diyabetli bireylerin hastalığı kabul ve eylem durumları üzerindeki etkisini değerlendirmeyi amaçlamıştır.

Yöntem: Bu araştırma kesitsel bir çalışmadır. Çalışma 1 Ocak- 30 Haziran 2023 tarihleri arasında çevrimiçi olarak yürütülmüştür. Çalışma 105 kişiyle tamamlanmıştır. Veriler; Kişisel Bilgi Formu, Hipoglisemi Korkusu Ölçeği (HKÖ), Kısa Dayanıklılık Ölçeği (KDÖ) ve Diyabetliler/Şeker Hastaları için Kabul ve Eylem Formu (DHKEF) kullanılarak toplanmıştır. Bu çalışmayı gerçekleştirmek için etik izin alınmıştır.

Bulgular: Katılımcıların ortalama yaşı 49,71±16,21'dir. %53,3'ü kadındır. %49,5'i oral diyabet ilacı kullanmaktadır. %67,6'sı rutin sağlık kontrollerine gitmektedir. %54,3'ü ek kronik bir hastalığa sahiptir. %24,8'i nöropatiye sahiptir. HKÖ'nün toplam puanı 27,93±22,16, KDÖ 16,63±4,14 ve DHKEF 45,21±10,98'dir. Geriye doğru eleme yöntemiyle yapılan Çoklu Regresyon Analizinde, gelirin giderden az olması, düzenli doktor kontrolleri ve endişeler katılımcıların DHKEF'nin %22,6'sını açıklamaktadır.

Sonuç: Çalışma, tip II diyabetli bireylerde hipoglisemi korkusu, psikolojik dayanıklılık ve hastalığı kabul etme arasında zayıf, negatif bir ilişki buldu. Bu bulgular, hastalık yönetimini geliştirmek için rutin kontroller sırasında psikolojik faktörleri değerlendirme ihtiyacının altını çizmektedir.

Anahtar Sözcükler: Hipoglisemi, Dayanıklılık, Diyabet

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Introduction

The International Diabetes Federation (IDF) has reported that diabetes has become a significant health concern, having reached critically high levels worldwide[1]. Currently, over 500 million individuals across the globe are affected by diabetes. In 2021, an estimated 537 million individuals were living with diabetes, with the number expected to rise to 643 million by 2030 and 783 million by 2045.[1] Type 2 diabetes (T2DM) is the most prevalent form, representing more than 90% of global diabetes cases.[1] In 2022, the prevalence of diabetes in Turkey was reported to be 11.4%.[2] T2DM affects the body's utilization of glucose for energy, impairing its effectiveness in using insulin and potentially leading to elevated blood sugar levels if left untreated.[3] Managing T2DM involves monitoring blood sugar levels and adopting healthy lifestyle changes. However, successful disease management is influenced by both physical health and psychological well-being[3].

Fear of hypoglycemia (FOH) refers to a specific and intense fear triggered by the possibility or occurrence of low blood sugar levels, affecting approximately one in seven individuals with either type 1 or type 2 diabetes.[4] Key factors influencing FOH include the duration of diabetes, education level, and the use of insulin therapy.[4] In T2DM, both severe and symptomatic hypoglycemia can adversely affect overall health and psychological well-being and further increase the FOH.[5] FOH is also associated with a reduced quality of life, diminished emotional health, poor diabetes self-management, higher A_1C levels, and greater frequency diabetes-related complications and symptoms.[6] Furthermore, Ruiz-Aranda et al. reported that individuals who experience FOH, individuals having higher resilience avoided the potentially adverse effects of anxiety and reported healthier levels of psychological adaptation and functioning when dealing with chronic illness.[7]

Psychological resilience refers to the capacity to withstand external stressors, navigate challenges, or attain favorable results notwithstanding the presence of risk factors.[8] Resilience strategies are often categorized into "additive" strategies, such as engaging in healthy behaviors (diet, exercise, social support), and "subtractive" strategies, such as avoiding maladaptive habits. Research shows that individuals with higher resilience tend to have better diabetes self-management and lower levels of diabetes-related distress.[9] An intriguing study by Crump et al., involving 1.5 million Swedish military recruits followed over 25.7 years, found that low-stress resilience may play a significant long-term role in developing T2DM.[10] Additionally, Parviniannasab et al., demonstrated that self-efficacy in diabetes management fully mediated the relationship between diabetes-related distress and resilience.[11]

Diabetes is a multifaceted condition that affects individuals both physically and psychologically, requiring them to make numerous daily decisions regarding their self-care.[12] Successful diabetes management involves both acceptance and proactive measures, which include acknowledging diabetes-related thoughts and emotions and understanding their impact on meaningful activities.[13] Saito and Kumano emphasized that acceptance and mindfulness play a crucial role for Japanese patients with T2DM, contributing to effective self-care and adherence to treatment.[14] Action strategies comprise the various behaviors and methodologies that individuals utilize to effectively manage diabetes, including alterations in lifestyle, compliance with pharmacological treatments, and consistent self-monitoring practices. A review of the literature reveals that while diabetes affects individuals both physically and mentally, both physical and psychological factors are influential in managing the disease. Therefore, this research aims to explore the effect of fear of hypoglycemia and psychological resilience on disease acceptance and the management strategies of individuals with T2DM.

Methods

Study Design

This research was a cross-sectional study. The study was conducted online between 1 January and 30 June 2023.

Setting and Sample

The research was carried out in Adana. The population of the research consisted of those who have T2DM. The individuals included in the study were those diagnosed with diabetes and were continuing their routine lives. They were not individuals who were hospitalized or came for check-ups in any hospital or clinic. The sample size was determined web-based using A-priori Multiple Regression analysis sample size estimation to perform Multiple Regression analysis with 80% power, 0.15 effect size, six estimator parameters, and 5% type I error to represent the population. The minimum number calculated was 97 individuals. A web-based calculator was used to estimate the sample size (Daniel Soper).[15] Individuals who were 18 years old and over, had T2DM, understood the Turkish language, lived in Adana city center, and volunteered to participate in the study were included in the study.

Data Collection

Data was collected using the snowball method via Google Forms. The first page of Google Forms had an accept button to give informed consent. A Google form link was sent to the person known to have diabetes, and they were asked to forward it to other individuals with type II diabetes that they know. Additionally, it was requested that it be in social media groups composed of individuals with type II diabetes of which they are members. The study was

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completed with 105 participants. Each form took approximately 12 minutes. Data were collected using PIF, FOH, BRS, and AADQ measurements.

Personal Information Form (PIF): This form, created by the researcher based on existing literature, includes questions related to socio-demographic characteristics and factors influencing sleep quality, such as age, gender, marital status, educational background, chronic illnesses, and body mass index.[11,12,14]

Fear of Hypoglycemia Scale (FOH): Developed by Cox et al. in 1987, the Hypoglycemia Fear Scale was designed to assess the fear of hypoglycemia in diabetic patients.[16] In Turkey, Erol (2012) conducted a validity and reliability study of the scale (Cronbach's alpha coefficient of 0.90).[17] The adapted Turkish version of the scale includes two subscales: behavior (15 items) and anxiety (17 items), totaling 32 items. Responses are scored as follows: "0 points: never; 1 point: rarely; 2 points: sometimes; 3 points: often; 4 points: always." The total score ranges from 0 to 128. While there is no specific cut-off point, a higher average score indicates a greater fear of hypoglycemia. In this present study, Cronbach's alpha coefficient was 0.949.

Brief Resilience Scale (BRS): Brief Resilience Scale (BRS): Developed by Smith et al. in 2008, the BRS measures psychological resilience using a 5-point Likert scale.[18] The scale consists of 6 items. The Turkish adaptation, including validity and reliability analyses, was carried out by Doğan (2015), who found an internal consistency coefficient of 0.83.[19] In this current study Cronbach's alpha coefficient was 0.625.

Acceptance and Action Diabetes Questionnaire (AADQ): Created by Gregg et al. in 2007, the AADQ is an 11-item Likert-type scale designed to assess the acceptance of diabetes-related thoughts and feelings and their impact on valued activities. Although the original scale did not have its own validity and reliability study, the authors used existing validation from their studies with diabetic patients. The 11-item form had a Cronbach's alpha coefficient of 0.94.[13] In Turkey, Karadere et al. (2019) conducted a validity and reliability study with diabetic patients, finding a Cronbach's alpha of 0.836 for the 9-item version of the scale. Higher scores on the scale indicate a higher level of acceptance.[20] In this study, Cronbach alpha coefficient was 0.824.

Ethical Considerations

The Non-Interventional Clinical Research Ethics Committee of X University granted ethical approval (2022-127/45) for the research. Participants were informed about the confidentiality and privacy of the study and were assured they could withdraw at any time. Written informed consent was obtained from all participants prior to the commencement of the study.

Data Analysis

Statistical analyses were performed using the TIBCO Statistica 13.5.0.17 program. The Shapiro-Wilk test was used to control the normality of continuous variables. Since the scale scores did not show a normal distribution, the linear relationship between them was expressed with the Spearman Rho correlation coefficient. Multiple linear regression (Backward elimination) was used to determine the factors affecting AADQ. Cronbach's alpha coefficient was used to express the reliability of the scale scores.

Results

The study comprised 105 participants with a body mass index (BMI) of 27.64±5.66 and a mean age of 49.71±16.21 years. The median duration of the disease was 8 years. The sample consisted of 53.3% males and 46.7% females. Regarding marital status, 72.4% were married, and 27.6% were single. Additionally, 79% of participants had children, while 21% did not have children. Among the participants, 42.9% had completed higher education, 32.4% had finished high school, 18.1% had completed primary school, and 6.7% were literate. Employment was reported by 61.9% of the participants, with 80% of these individuals working day shifts, 16.9% working both day and night shifts, and 3.1% working night shifts. Of the participants, 15.2% utilized both insulin and oral antidiabetic drugs, 18.1% were on insulin therapy, and 49.5% were taking oral antidiabetic drugs. Notably, 17.1% of participants were not taking any antidiabetic medication. In the past year, 15.2% had been hospitalized due to diabetes-related reasons, while 84.8% had not. Routine doctor check-ups were reported by 67.6% of participants. 54.3% of the participants reported having at least one chronic condition other than diabetes. The most common comorbid condition was hypertension (84.2%) followed by hypercholesterolemia (68.4%) and coronary artery disease (50.9%). The most frequently reported diabetes-related complications included neuropathy (24.8%), retinopathy (15.2%), and diabetic foot (6.7%). 62.9% of participants reported no diabetes-related complications (Table 1).

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Table 1. *Distributions of socio-demographic characteristics of participants (n=105)*

		Mean±SD Median [IQR]	Min-Max
Age		49.71±16.21	18-82
BMI		27.64±5.66	16.62-47.32
Duration of disease		8 [2-17.5]	0.33-35
		n	**%**
Gender	Male	56	53.3
	Female	49	46.7
Marital status	Single	29	27.6
	Married	76	72.4
Having children	Yes	83	79.0
	No	22	21.0
Education Level	Literate	7	6.7
	Primary school	19	18.1
	High school	34	32.4
	Graduate	45	42.9
Employment	Yes	65	61.9
	No	40	38.1
Working shift (n:65)	1. Day shift	52	80.0
	2. Night shift	2	3.1
	3. Day and night	11	16.9
Income level	Income less than expenses	33	31.4
	Income equal to expenses	59	56.2
	Income more than expenses	13	12.4
Treatment type	Oral antidiabetic	52	49.5
	Insulin	19	18.1
	Oral antidiabetic + insulin	16	15.2
	Did not take any antidiabetic medicine	18	17.1
Hospitalization for any diabetes or sugar-related reason in the last year	Yes	16	15.2
	No	89	84.8
Going to routine doctor check-ups	Yes	71	67.6
	No	34	32.4
Chronic disease other than diabetes	Yes	57	54.3
	No	48	45.7
Chronic disease (n:57)	Hypertension	48	84.2
	Cholesterol	39	68.4
	Coronary artery disease	29	50.9
	Other	24	42.1
Other health problems related to diabetes	Diabetic foot	7	6.7
	Retinopathy	16	15.2
	Amputation	1	1.0
	Neuropathy	26	24.8
	Nephropathy	4	3.8
	No problems	66	62.9
Living with	Alone	9	8.6
	Family	96	91.4

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The total score of the FOH was 27.93±22.16, the mean score of behaviors (subdimension of FOH) was 13.45±12.16, and the mean score of worries (subdimension of FOH) was14.49±13.19. The BRS mean score was 16.63±4.14, and the AADQ was 45.21±10.98 (Table 2). Weak and negative relationships existed between AADQ, FOH, and BRS (Table 3).

Table 2. *Distribution of the FOS, BRS and AADQ*

	Mean±SD	Median [IQR]	Min-Max	Cronbach's Alpha
Behaviours	13.45±12.16	11 [4-19.5]	0-48	0.925
Worries	14.49±13.19	11 [3-23]	0-55	0.943
FOS total	27.93±22.16	24 [9.5-39]	0-90	0.949
BRS	16.63±4.14	17 [15-19]	6-30	0.625
AADQ	45.21±10.98	47 [37.5-55]	11-62	0.824

Table 3. *Relationship between AADQ, FOS, and BRS*

		Behaviours	Worries	FOS	BRS
AADQ	r	-0.257	-0.250	-0.278	-0.026
	p	**0.008**	**0.010**	**0.004**	0.794

r: Spearman rho corelation coefficient

The multiple regression analysis revealed that the model significantly explained 22.6% of the variance in AADQ scores (R^2 = 0.226, F = 9.827, $p < 0.001$). Among the predictors, having regular doctor check-ups was positively associated with AADQ scores (B = 9.099, $p < 0.001$), indicating that participants who regularly attended check-ups had significantly higher AADQ scores. Worry levels were negatively associated with AADQ scores (B = -0.247, p = 0.001), suggesting that higher levels of worry were linked to lower AADQ scores. Income less than expenses showed a positive but non-significant association with AADQ scores (B = 3.931, p = 0.064). Overall, the model indicates that regular doctor visits and worry levels are significant predictors of AADQ scores, with regular check-ups contributing to higher scores and worries contributing to lower scores (Table 4).

Table 4. *Determinants of AADQ According to Backward Elimination Multiple Regression Analysis*

Model		Unstandardized Coefficients		Standardized Coefficients	95.0% Confidence Interval for B			
		B	Std. Error	Beta	Lower Bound	Upper Bound	t	Sig.
AADQ R^2:0.226 F:9.827 p<0.001	(Constant)	41.393	2.086		37.255	45.532	19.841	0.000
	Income less than expenses	3.931	2.101	0.167	-0.237	8.100	1.871	0.064
	Having regular doctor check-ups	9.099	2.070	0.390	4.991	13.206	4.395	**0.001**
	Worries	-0.247	0.074	-0.296	-0.393	-0.101	-3.350	**0.001**

p: Backward Elimination Multiple Regression Analysis

Discussion

This study evaluated the effect of hypoglycemia fear and the psychological resilience of individuals diagnosed with type II diabetes on disease acceptance and action. The participants demonstrated low-level hypoglycemia fear, moderate resilience, and moderate acceptance and action for T2DM.

The results indicated that participants exhibit a moderate acceptance and action concerning T2DM. Acceptance is crucial in managing diabetes as a chronic condition.[21] Jaworski et al. found that insufficient acceptance of the disease negatively affects patients' adherence to dietary recommendations.[22] Taskin Yilmaz et al. reported a

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correlation between disease acceptance levels and glycemic control, noting that individuals with higher acceptance levels achieved better glycemic control.[23] Acceptance can significantly influence the psychological, physiological, and behavioral aspects of T2DM management. Therefore, healthcare professionals can create training programs and use a tailored method to track patients' acceptance of the illness.

In this present study, the results demonstrated that participants had low levels of hypoglycemia fear. This is consistent with the broader literature, which indicates that individuals with T2DM can experience varying levels of FOH, ranging from low to high. [24,25] FOH has a direct influence on self-management behaviors[7] while adaptive FOH can motivate individuals to plan their behaviors to maintain normoglycemia, excessive fear can lead to constant anxiety, restrict personal freedom, and ultimately diminish the quality of life.[26] Maintaining a balanced level of FOH might be crucial for promoting healthy self-management without compromising well-being.

Participants in this study demonstrated moderate levels of resilience, which is consistent with previous research showing that people with T2DM have low to moderate resilience levels.[7,27] Resilience, defined as the ability to adapt and recover from challenges[8], may play a crucial role in effective diabetes management. Boell et al., showed a relationship between high average resilience and adequate performance in diabetes care.[28] Furthermore, meta-analysis research found that, in comparison to usual care, interventions that focused on building resilience (constructs) improved HbA1c levels in patients with T2DM.[29] The moderate level of psychological resilience observed in the participants of this study highlights significant potential for improved diabetes management. Resilience may not only support psychological adjustment but also enhance the overall quality of diabetes care.

In this study, the relationship between fear of hypoglycemia and resilience with acceptance and action in T2DM patients was found to be weak and negative. This result suggests that greater fear and lower resilience may slightly hinder how individuals accept and manage their diabetes. Backward elimination multiple regression analysis revealed that factors such as having an income less than expenses, regular doctor check-ups, and concerns (a subdimension of FOH) accounted for 22.6% of the variance in the AADQ scores of participants. Fear of hypoglycemia can directly impact self-management in T2DM patients.[25] Literature recommends that healthcare providers address patients' fears of hypoglycemia, reduce excessive avoidance behaviors, and support patients in improving their quality of life.[30] Characteristics such as income level, regular medical check-ups, and concerns should be considered as starting points for enhancing acceptance and action among individuals with T2DM. Furthermore, healthcare professionals should consider confounding factors like social support, cultural perceptions of chronic disease, or access to healthcare resources in the relationship between acceptance and disease management.

Conclusion

This study was conducted to evaluate the effect of hypoglycemia fear and resilience of individuals diagnosed with T2DM on the disease acceptance and action situations. The results of this study highlight the significant impact of hypoglycemia fear and psychological resilience on disease acceptance and action in individuals diagnosed with T2DM. The findings revealed that participants exhibited low levels of fear of hypoglycemia, moderate levels of resilience, and moderate levels of acceptance and action in managing their diabetes. These insights are critical for understanding how individuals cope with diabetes-related thoughts and emotions and how these factors influence their ability to engage in behaviors that align with their health goals.

Based on the study's results, healthcare providers, especially in primary care settings, should consider the importance of understanding how patients accept and manage diabetes-related thoughts and feelings and how these factors affect their ability to take meaningful action in managing their condition. Holistic patient assessments during routine check-ups should include evaluations of psychological resilience and fear of hypoglycemia. Healthcare professionals might provide thorough instruction on hypoglycemia indications, symptoms, and management to allay patients' anxieties and boost their self-esteem. Furthermore, incorporating strategies to build psychological resilience—such as stress management techniques and problem-solving skills—into patient education programs could be highly beneficial.

Healthcare providers can empower patients to manage their diabetes actively by equipping them with the necessary tools and knowledge to make informed decisions. This holistic approach improves patients' confidence, reduces fear, and promotes more effective and consistent diabetes self-management.

Although this study provides valuable insights, it is essential to acknowledge potential confounding factors, such as variations in patients' socio-economic status, access to healthcare, and individual differences in psychological traits, which may influence the results. Future research could benefit from larger, more diverse samples and additional variables like social support, education level, or comorbid conditions, to provide a more comprehensive understanding of how these factors influence disease acceptance and action.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Limitations

The study included only 105 participants, which may limit the generalizability of the findings. A larger sample size could better represent different demographic groups and variables. The online data collection method may have limited participation to individuals within a specific age group who have internet access or are familiar with technology. This could affect the representativeness of the sample in relation to the general population.

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