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Relationship between Fear of Hypoglycemia and Spiritual Well-Being in People with Type 2 Diabetes: A Single Center, Cross-Sectional Study from Iran

ABSTRACT

Objective: One of the most important complications in patients with type 2 diabetes is the fear of hypoglycemia (FOH). Spiritual health as the last dimension of health can affect the complications caused by the disease. The present study aimed to determine the relationship between FOH and spiritual well-being (SWB) in patients with type 2 diabetes.

Materials and methods: This study is a cross-sectional descriptive study of correlation type. 380 patients with type 2 diabetes were included in the study with convenience sampling. Two questionnaires of FOH (HSF-II) and Palutzian & Ellison SWB were used to collect data. Data were analyzed using R software version 4.0.4. In the analysis, Pearson's correlation coefficient and simple and multivariable linear regression were used.

Results: A total of 380 patients with type 2 diabetes were included in this study. The mean and standard deviation of the age and diabetes duration of participants were 56.89 ± 11.42 and 11.7 ± 15.55 years, respectively. Most of the participants were women 244 (64.2%). The mean score of SWB and FOH in patients were 89.55 ± ± 14.32 and 13.34 ± 16.12, respectively. There was also a positive and significant relationship between SWB and FOH using Pearson correlation coefficient (p = 0.001).

Conclusions: According to the results, with increasing the score of FOH, the score of SWB also increased. Although increasing SWB has no effect on reducing the FOH, it is a unique energy that relates to the physical, mental, and social dimensions of humans. (Clin Diabetol 2023; 12; 2: 87–94)

Keywords: fear of hypoglycemia, spiritual health, type 2 diabetes, hemoglobin A1c

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Introduction

The most important external risk of diabetes is hypoglycemia or blood glucose drop following treatment [1]. Hypoglycemia is one of the obstacles for proper control and monitoring of blood glucose in patients with type 2 diabetes [2]. It is estimated that hypoglycemia occurs annually in 5–20% of people with diabetes treated with oral antidiabetic drugs [3]. Following hypoglycemia in patients with type 2 diabetes, physical and psychosocial disorders, anxiety, stress, and FOH occur [4]. The FOH can affect diabetes control and quality of life [3, 5]. Factors influencing the FOH include increasing the frequency of hospitalization [6], hyperlipidemia [7], rigid hypoglycemic medication regimens and the increasing number of medications [5],

a previous experience of hypoglycemia, especially during the past 12 months [8, 9]. In this regard, proper understanding of the above factors can be very effective in improving and preventing the FOH [9]. Over the past three decades, numerous new technologies have been designed to help patients with type 2 diabetes control their treatment regimens, including continuous glucose monitoring (CGM) systems, insulin pens, and insulin pumps. While the purpose of these devices is to improve glycemic control, they can also affect psychological variables such as FOH [8]. Another method that affects the FOH is spiritual health which has been considered as the latest dimension of health, along with other dimensions of physical, mental, and social health and causes the integration of other dimensions [10].

The World Health Organization has accepted spirituality as a principle for promoting the health of individuals [11] and it also considers the spiritual dimensions in defining health [12]. Many researchers acknowledge that the spiritual health components often have positive preventive effects [13]. Spiritual well-being can have a positive effect on the mental health and quality of life of patients. Also, spiritual well-being among patients with chronic disease such as diabetes may provide a great encouraging result for overcoming life management challenges [14, 15]. On the other hand, in some other studies, such effects have not been found and even its negative effects have been emphasized [4, 16, 17]. Other points that are important in the field of this research are the cultural and religious differences between Iran and Western and Christian societies [2, 16], the contradictory results of the relationship between these factors, and the need to pay attention to the importance of promoting mental health in patients with type 2 diabetes.

Fear of hypoglycemia in patients with type 2 diabetes is one of the components related to mental health that may be affected by spiritual well-being. Therefore, if the relationship between the two components is found, it may be possible to influence the fear of hypoglycemia by improving spiritual well-being. The researcher subsequently decided to investigate the relationship between SWB and FOH in patients with type 2 diabetes.

Materials and methods

Study design

This was a cross-sectional study of correlation type. The present study was conducted on 380 patients with type 2 diabetes referred to endocrinology clinic of Diabetes Clinic of Booali Sina Hospital in Qazvin, in 2020. The sampling method in the study was convenience. In the current study, because two questionnaires were used, one containing 18 and the other containing 20 questions, the number of samples collected was ten times the total sum of questions. Therefore, the estimated sample size was 380 patients [18] who were selected by the convenience sampling method. Questionnaires were filled out in the clinic by the patient and with the researcher's explanations in 10 minutes. After completing the questionnaires, to attract the cooperation of patients, they received pamphlets, training, and advice on caring for diabetes complications. The study was performed in an environment where the researcher and the patient felt comfortable and relaxed.

Study population

Patients with type 2 diabetes were included in the study, according to the inclusion and exclusion criteria, through the convenience sampling method; when the sampling reached 380 people, the sampling was completed. The inclusion criteria were age over 30 years, informed consent to participate in the study, type 2 diabetes, according to the written diagnosis of a specialist or being under treatment for diabetes. Exclusion criteria were: pregnant women, people who had acute mental health problems in the past six weeks that required hospitalization and were not easily treated.

Measurements

Data collection tools in this study included three questionnaires: demographic information questionnaire including age, gender, marital status, education, occupation, diabetes duration, type of treatment, underlying diseases, body mass index, arm circumference, abdomen circumference, hip circumference, and fasting blood glucose, and etc. Information on fasting blood glucose and glycated hemoglobin were extracted from the patient's record file. The measurements were performed without shoes using a tape measure and the patient was weighed with a weighing scale Digital Ofogh, model 2003D.

The Spiritual Well-being (SWB) Questionnaire by Palutzian and Ellison (1982) contains 20 questions, 10 of which measures religious well-being, and the other 10 questions measures individual existential health [19]. The SWB score is the sum of these two subgroups and ranges from 20 to 120. The answers to these questions are categorized in the form of a six-point Likert scale from strongly disagree to strongly agree. The higher the score, the higher the spiritual well-being. In the end, individuals' SWB scores were divided into three categories: low (20–40), medium (41–99), and high (120–100). Cronbach's alpha coefficient for the reliability of this tool was determined by Abbasi et al. to be 0.87 [20].

In the present study, FOH was measured using the Hypoglycemia Fear Survey. It includes 18 questions that measure a patient's level of fear over the past six months and the scores range from 0 to 72. Each question has a score of 0 to 4, with a higher score indicating greater fear of hypoglycemia [21]. Finally, individuals' FOH scores were divided into three categories: low (0–24), medium (25–48), and high (49–72). This questionnaire was used in the study of Momeni et al. (2016), its Cronbach's alpha coefficient was 0.87 and its reliability was obtained by retesting equal to 0.76 [7].

Statistical analysis

Data were analyzed using R software version 4.0.4. Pearson's correlation coefficient was used to determine the relationship between FOH and SWB. The effects of different variables were analyzed with regression on SWB in three different ways. First, it was investigated as a single variable with the "Enter" method. In order to select the best model employing the MASS (Modern Applied Statistics with s) package, the stepwise algorithm based on the AIC (Akaike Information Criterion) criterion was used. Also, multiple linear regression method was used to investigate the effect of the variables identified in the best model on the response variable (SWB). At all stages, a significance level of 0.05 was considered.

Ethical approval

The present study has been registered in the ethics committee of Qazvin University of Medical Sciences with the ethics code of IR.QUMS.REC.1398.360. The rights of the participants were protected by ensuring privacy during the data collection. At the beginning of the questionnaire, the confidentiality of information with researchers was emphasized. Informed consent was provided by each of the participants before being included in the study.

Results

Data related to 380 participants, 244 of whom were women (64.2%), were analyzed. The mean and standard deviation of the age of participants in this study was 56.89 ± 11.42 with a range of 30–84 years. Two hundred forty nine participants (65.5%) had a history of high blood lipids, 210 (55.3%) had a history of hypertension, and 34 (8.9%) had a history of psychiatric illness (without the need for hospitalization and non-acute, which is easily treated). Also, 41 participants (10.8%) had a history of tobacco or opium smoking. Among the participants, 81.6% reported long-term complications of diabetes. Also, among the patients with complications, 21.1% had kidney complications, 43.4% ocular complications, 31.6% cardiovascular complications, and 60% neurological complications. The most common cause of hospitalization in participants with a history of hospitalization was hyperglycemia in 102 patients (26.8%); while 147 (38.7%) participants had no hospitalization history. Two hundred four participants (57.3%) used insulin, and 176 (46.3%) used pills (Tab. 1).

The mean and standard deviation of the FOH scores in patients with type 2 diabetes was 13.34 ± 16.12 with a confidence interval of 95% [CI: (1.72; 14.96)], which was low, according to the maximum value of 72 for these questions. The mean and standard deviation of the SWB scores in patients was 89.55 ± 14.32 with a confidence interval of 95% [CI: (88.14, 91.02)], two of which (0.5%) had low SWB, 266 (70%) had moderate SWB, and 112 (29.5%) had high SWB. In examining the components of SWB, the mean and standard deviation of the existential well-being scores were 39.56 ± 7.91 with a confidence interval of 95% [CI: (38.76, 40.36)], and of religious well-being scores were 49.98 ± 9.29 with a confidence interval of 95% [CI: (49.07, 50.95)]. Pearson's correlation coefficient showed that there was no significant relationship between SWB and FOH with glycated hemoglobin ($p > 0.05$), while there was a positive and significant relationship between SWB and FOH ($r = 0.172$, $p = 0.001$) (Fig. 1).

Table 2 shows the results of univariate model analysis of the relationship between SWB and FOH, demographic variables, and other variables. The results of this univariate analysis showed that FOH ($p = 0.001$), age ($p = 0.001$), marital status ($p = 0.027$), type of treatment ($p = 0.043$), living with someone ($p = 0.015$), BMI ($p = 0.045$), number of hospitalization days ($p = 0.036$), and long-term renal ($p = 0.005$), and neurological ($p = 0.008$) complications had a significant relationship to SWB score. According to the latest model, the variables of FOH, age, marital status, education, type of treatment, living with someone, BMI, arm circumference, source of patient information, and renal complications were significant and extracted ($p < 0.05$).

The regression analysis was used to determine the relationship between SWB and underlying variables in patients with type 2 diabetes. Table 3 shows that variables of age, marital status, education, treatment with twenty to thirty units of insulin, treatment with more than thirty units of insulin, living with someone, body mass index, source of information, and long-term renal complications were significant. It was shown that for one-unit increase in FOH, the amount of SWB increased by 0.15 units on average. One of the notable results in the present study was that for one-unit increase in BMI, SWB increased by 0.66 units [$p < 0.001$, 95% CI: (0.3, 1.02), Beta = 0.66]. Also, for each hospitalization, SWB

Table 1. Baseline Characteristics of Participants

Qualitative variable	N (percentage)
Gender	
Female	244 (64.2)
Male	136 (35.8)
Marital status	
Single	7 (1.8)
widow	61 (16.1)
Divorced	6 (1.6)
Education	
Illiterate	125 (32.9)
Primary school	122 (32.1)
Middle school	59 (15.5)
Diploma	51 (13.4)
University degree	32 (6.1)
Occupational status	
Employed	73 (19.1)
Unemployed	9 (2.4)
Decrepit	8 (2.1)
Retired	70 (18.4)
Housekeeper	220 (57.9)
Type of treatment	
Insulin less than 30 units	58 (15.3)
Insulin more than 30 units	146 (38.4)
Pill	176 (46.3)
Disease complications	
Renal	80 (21.1)
Ocular	165 (43.4)
Cardiovascular	120 (31.6)
Neurological	228 (60.8)
History of smoking or opium	
Yes	41 (10.8)
No	339 (89.2)
Quantitative variables	**Mean (SD)**
BMI [kg/m^2]	28.45 ± 5.09
Arm circumference [cm]	32.69 ± 4.43
Abdominal circumference [cm]	102.24 ± 12.09
Hip circumference [cm]	110.79 ± 11.57
Fasting blood glucose [mg/dL]	182.01 ± 73.05
Glycosylated hemoglobin [mmol A1c/mol Hb]	8.89 ± 2.06
Number of hospitalizations	12.35 ± 17.94
Days of hospitalization	1.76 ± 2.15
Age [years]	56. 89 ± 11.42
Diabetes duration	11.15 ± 7.55

BMI — body mass index; SD — standard deviation

decreased by approximately 0.07 units (p = 0.067). In patients with renal problems, SWB increased by 5.25 units (p = 0.006) (Tab. 3).

Discussion

This study aimed to investigate the relationship between SWB and its dimensions (religious well-being and existential well-being) and FOH in patients with type 2 diabetes. The mean score of FOH in the present study was 13.4, indicating low FOH of patients. In Momeni et al. [7] study, the mean and standard deviation of the FOH score was 16.8 ± 16.33, which was consistent with this study; but its mean was lower than in the present study. They conducted their research on patients with type 2 diabetes who were using only oral antidiabetic drugs. Also, in the study of Mahabalshetti et al. [22], the FOH score was reported at a moderate level, which was inconsistent with the present study, which may be due to differences between the studied populations; because patients with uncontrolled diabetes were the target population of their study.

In the present study, the results indicated the existence of moderate SWB of the research community. In the study of Shahdadi et al. [2], the patients' spiritual health score was at a high level and this difference could be due to differences in the questionnaires and the number of samples. Their study was performed on 50 patients with type 2 diabetes in which the Spiritual Assessment Inventory was developed and evaluated by Hall et al. There was no significant difference between spiritual health scores of patients with controlled and uncontrolled blood glucose. The results of a study by Rahimi et al. [23] stated that the spiritual health scores of nursing, midwifery, and medical emergency students were at a moderate level, which was in line with the results of the current study. Of course, such results were to be expected in our society, which is religious and inclined to spiritual values; but the religious atmosphere in Iran may have affected the answering to questions.

In the present study, there was no significant relationship between glycated hemoglobin and FOH. According to various studies, factors such as the type of treatment (insulin oral antidiabetic drugs) [3], the real experience of severe hypoglycemia during the last six months [21], trait anxiety followed by FOH [25] and subsequent glycated hemoglobin were related to each other. As Rechenberg et al. [25] found that in young people with type 1 diabetes, symptoms of anxiety were associated with higher levels of glycated hemoglobin, poor self-management, poorer coping behaviors, depression symptoms, FOH, and reduced frequency of blood glucose control and it affected health outcomes. These results were inconsistent with the current study; in which glycated hemoglobin did not decrease with a decrease in FOH and no significant relationship was found. Perhaps this was because, in the present study, trait anxiety was not measured, which affected the FOH,

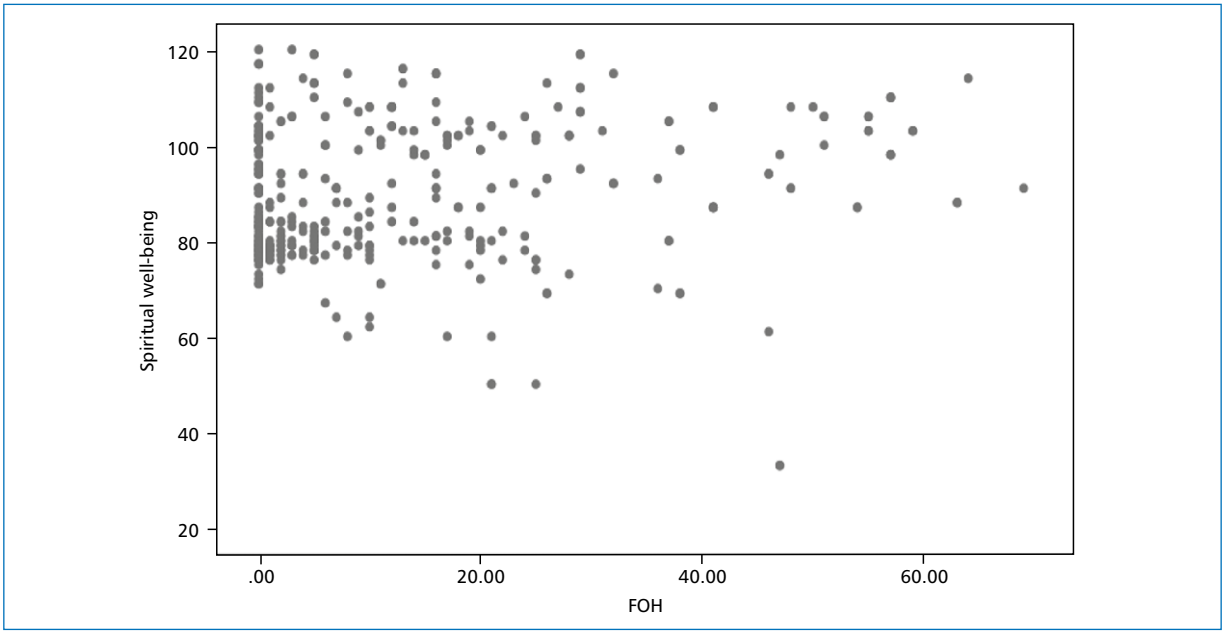

Figure 1. Correlation between FOH and SWB
FOH — fear of hypoglycemia; SWB — spiritual well-being

Table 2. Evaluation of the Effect of FOH and Underlying Variables on Spiritual Health

Variables	Univariate models			The best model		
	Residual SD (df)	SD (df)	P-value	Residual SD (df)	SD (df)	P-value
FOH	75255 (377)	2302 (1)	0.001	75255 (377)	2302 (1)	**< 0.001**
Age	75283 (377)	2274 (1)	**0.001**	73444 (376)	1811 (1)	**0.001**
Marital status	757707 (375)	1849 (3)	**0.027**	72039 (373)	1405 (3)	**0.030**
Gender	77513 (377)	40 (1)	0.657	—	—	—
Education	776971 (374)	586 (4)	0.584	69984 (369)	2055 (4)	**0.011**
Type of treatment	75563 (374)	1993 (4)	0.043	68019 (365)	1965 (4)	**0.014**
Living with whom	75460 (374)	2097 (4)	0.034	66050 (361)	1969 (4)	**0.014**
BMI	73742 (377)	815 (1)	**0.045**	63536 (360)	2514 (1)	**< 0.001**
Arm circumference	77416 (377)	140 (1)	0.409	62465 (359)	1072 (1)	**0.009**
Fasting blood glucose	76986 (377)	571 (1)	0.095	54588 (347)	40 (1)	0.612
Glycosylated Hemoglobin	77489 (377)	67 (1)	0.567	53667 (347)	920 (1)	**0.015**
Source of information	71330 (371)	6227 (7)	**0.001**	56959 (352)	5506 (7)	**0.001**
Days of hospitalization	76666 (377)	890 (1)	0.036	56772 (351)	187 4 (1)	0.276
L-t renal complications	75997 (377)	1560 (1)	**0.005**	55307 (350)	1465 4 (1)	**0.002**
L-t neurological complications	76144 (377)	1413 (1)	0.008	54898 (349)	409 4 (1)	0.107

BMI — body mass index; FOH — fear of hypoglycemia; L-t — long-term; SD — standard deviation

and only its relationship with SWB was investigated. Also, the reason for this discrepancy could be due to differences in the sampling environment and the research community. Because Rechenberg's study was on patients with type 1 diabetes, which mostly affects young people and children; while the current study was on patients with type 2 diabetes.

In the present study, no significant relationship was observed between spiritual health and glycated hemoglobin. In a study by Newlin et al. [4] in patients with type 2 diabetes, a significant relationship was found for the first time between glycemic control, which was measured by the level of glycated hemoglobin and religion and spirituality. However, the simple

Table 3. Evaluation of Regression Coefficients Related to the Best Elected Model among Participants

Variables	Regression coefficient (95% confidence interval)	P-value
FOH	0.15 (0.06, 0.24)	0.002*
Age	0.31 (0.17, 0.45)	< 0.001*
BMI	0.66 (0.3, 1.02)	< 0.001*
Fasting blood glucose	–0.03 (–0.05, 0)	0.043*
Glycosylated hemoglobin	1.1 (0.21, 1.98)	0.015*
Days of hospitalization	–0.07 (–0.15, 0)	0.067
Marital status	—	
Married	–20.1 (–41.23, 1.03)	0.063
Divorced	–28.76 (–49.04, 8.48)	0.006*
Widow	–18.96 (–39.37, 0.44)	0.069
Education	—	
Primary school	–0.23 (–3.62, 3.16)	0.894
Middle school	5.04 (0.77, 9.32)	0.021*
Diploma	6.69 (224, 11.15)	0.003*
University degree	9.59 (3.15, 16.02)	0.004*
Type of treatment	—	
10 to 20 units of insulin	–2.91 (–12.42, 6.59)	0.549
20 to 30 units of insulin	–13.11 (–20.96, –5.26)	0.001*
More than 30 units of insulin	–9.75 (–16.15, –3.53)	0.003*
Pill	–6.89 (–13.13, –0.64)	0.031*
Living with whom	—	—
Living with a spouse	11.39 (2.63, 20.15)	0.011*
Living with a spouse and children	13.13 (4.43, 21.83)	0.003*
Living with children	9.13 (2.82, 15.45)	0.005*
Living with parents	–0.26 (–20.3, 19.79)	0.98
Source of information	—	
Physician	7.58 (4.23, 10.94)	< 0.001*
Nurse	5.18 (1.53, 8.83)	0.006*
Family and relatives	4.63 (–5.02, 14.28)	0.348
Radio and TV	16.9 (8.06, 25.73)	< 0.001*
Internet	–3.05 (–30.37, 24.27)	0.827
Magazines and educational books	7.14 (–9.21, 23.5)	0.393
Patient's friends	12.73 (–5.83, 31.29)	0.18
Long-term complications	—	
L-t renal complications	5.25 (1.52, 8.97)	0.006*
L-t neurological complications	2.46 (–0.53, 5.44)	0.108

*Significant; BMI — body mass index; FOH — fear of hypoglycemia

linear regression model indicated that the dimensions of existential and religious well-being related to SWB were not related to glycated hemoglobin; therefore, these results were consistent with the current study.

The results of the present study showed that the mean of SWB had no significant relationship with gender, but had a significant relationship with age, marital status, and education. The results of a study by Rahimi et al. [26] revealed that there was a significant difference between the mean score of spiritual health and gender variable, so that female students had higher spiritual health than male students. These results were inconsistent with the present study and may be due to the different roles and characteristics of women and

their greater compatibility with spiritual principles. Also, in the study of Rahimi [26], there was no statistically significant difference between the scores of the spiritual health of nursing and midwifery students with age, marital status, and academic year, which was inconsistent with the current study, in which with increasing age, SWB also increased. Perhaps this difference was due to differences in the age range of the study population and their level of education. In addition, our study population was patients with type 2 diabetes.

In the present study, it was found that for every time being hospitalized, SWB decreased marginally, but this relationship was not significant. On the other hand, in people with renal complications, SWB increased and the relationship was positive and significant. Diabetes not only threatens the physical well-being of patients, but also threatens their social, functional, and emotional well-being. The results of a study by Jafari et al. [17] suggest that feelings of inner peace and innate power may protect against negative feelings and may lead to maintaining self-care behaviors and thus better blood glucose control in patients with type 2 diabetes. This point indicates the need to pay attention to spiritual issues in the care of patients with type 2 diabetes. In the same study, the controlled group of patients with type 2 diabetes glycated hemoglobin level $\leq$ 7% had a proper and a more desirable quality of spiritual health than the uncontrolled group glycated hemoglobin level $>$ 7%. This correlation was inconsistent with the current study, perhaps due to the fact that Jafari's research was about diabetes control, whereas the current study examined the FOH as a moderating factor. The FOH can be caused by certain types of hypoglycemic experiences, for example, a history of traumatic periods, which affect spiritual health. On the other hand, long-term renal complications due to diabetes, which was a type of traumatic event, increased SWB, indicating a positive and significant relationship ($p = 0.006$). It is also important to know that the Functional Assessment of Chronic Illness Therapy – Spiritual Well-being (FACIT-Sp) scale is not a specific tool for diabetes to assess the quality of life and spiritual well-being, used in the Jafari study.

The limitations of this study were the cross-sectional nature of it and the small number of samples. It is suggested that all patients with type 2 diabetes, especially those under insulin treatment, be evaluated in terms of FOH, and that appropriate methods be used to control it after identifying. Hence, the research team decided to conduct this study to investigate the relationship between FOH and SWB; therefore, it is suggested that in order to understand this relationship, qualitative studies be conducted in the future with the aim of examining the spiritual experiences of patients with type 2 diabetes with FOH.

Conclusions

According to the results, with increasing SWB score, the FOH score also increased. Although increasing SWB has no effect on reducing FOH, the SWB is a unique energy that interacts with the physical, mental, and social dimensions of humans. On the other hand, the FOH seems to be a complex structure that results from several psychological, situational, behavioral, and even developmental processes, and its impact on diabetes management has not yet been well understood. Therefore, it is suggested that further studies be done to clarify this relationship. It also seems that SWB should be explored more to determine its relationship with diabetes control and management. Paying attention to the SWB component in patient education and the curriculum of medical students may help determine the effects of this component over time on other complications of diabetes.

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Conflict of interest

None declared.

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