Diabetes Distress among Egyptian University Students with Type 1 DM: An Intervention Study

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Abstract

Background: Diabetes Distress is a significant problem that affects T1DM patients and has negative impacts on their physical and mental health. T1DM is a chronic autoimmune disorder requiring lifelong management, including daily blood glucose monitoring, insulin administration, and lifestyle modifications. These demands can lead to feelings of anxiety and frustration, which can contribute to DD**. Objectives:** To Assess the impact of diabetes distress (DD) on quality of life and glycemic control among Menoufia University students with type 1 DM and to evaluate the effect of coping skills training on DD, Quality of life, and glycemic control. **Methods:** A cross-sectional interventional study of 130 patients with T1DM among Menoufia University students was selected by convenience sample. They were evaluated through a structured self-administrated questionnaire and HbA1c measurement, followed by implementing coping skill training on patients with DD (66) and reassessing after three months. **Results:** The present study involved 130 patients with a mean age of 20.26± 1.778 years. The study revealed that the prevalence of DD among the study group was 50.8 %**.** The mean HbA1c level was 8.54. Total DDS and Quality of life significantly improved after implementing coping skill training in patients with DD. There was also better glycemic control, with a p-value of less than 0.05. **Conclusion**: DD is prevalent among type 1 diabetic patients. Coping skills training positively impacted DD, quality of life, and glycemic control.

Keywords: Coping skill training, Diabetic patients, HbA1c, Quality of life.

Introduction

Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition mainly autoimmune in which the pancreas produces little or no insulin.(1)

Different factors, including genetics and some viruses, may contribute to type 1 diabetes. Although type 1 diabetes usually appears during childhood or adolescence, it can develop in adults. (2)

According to the International Diabetes Federation, the global diabetes prevalence in 2021 was estimated to be 10.5% (536.6 million people), rising to 12.2% (783.2 million) in 2045. (3)

Young people with type 1 DM and mental health problems are at higher risk of

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adverse diabetes outcomes than those without such comorbidities, including more frequent episodes of diabetic ketoacidosis and higher rates of hospitalization.[4]

Diabetes distress (DD) or diabetes-related distress is a form of emotional distress that is specific to diabetes and reflects the emotional response to a demanding illness. It encompasses the significantly adverse emotional reactions to all aspects of diabetes and diabetes care. This includes DM diagnosis, treatment of complications, and self-management demands (testing and monitoring blood glucose level, compliance with dietary regimen, and engaging in regular physical activity).[5]

DD is a rational response to the demands of a challenging long-term illness and is not considered a psychopathology. It differs from major depressive disorder. While DD symptoms are like those of depression, they are not severe enough to meet the diagnostic criteria for major depressive disorder. [6]

The researchers can educate the patients on coping strategies through coping skills training. Coping skills training is based on Bandura's social cognitive theory, which hypothesizes that practicing a new behavior, e.g., learning to cope successfully with a problem, can improve self-efficacy and increase positive behaviors. Researchers showed that coping and stress reactivity were associated with self-management and metabolic control, such as hemoglobin A1C, in patients with type 1 diabetes. [7]

This study aims to examine the effect of coping skills training on DD, quality of life, and glycemic control and the influence of DD on these.

Patients and methods

This study was an interventional study. The study took over 24 months, commencing on September 1, 2021, and ending in August 2023.

The sample size was calculated based on the prevalence of DD among people with type 1 diabetes, which was found to be 52%, the [6] power of the study (80%), and a 95% confidence interval; a sample size of 115 patients was obtained, and it was increased to 130 patients to accommodate possible participant dropouts.

All patients with type 1 DM who fulfilled the inclusion criteria, which included all T1DM who were at least three months after diagnosis of the disease, were enrolled in the study by convenience sample till the sample size was reached.

The study was performed at the Student Hospital, which is linked with Menoufia

University Hospitals and is located in Shebin Elkom, and the intervention program sessions were held at the Family Medicine Department of Menoufia University's Faculty of Medicine.

The study received approval from the Ethical Committee of the Faculty of Medicine, Menoufia University. Before participation, all individuals were provided with a clear and understandable explanation of the research objectives and the potential benefits for themselves and the community.

Informed consent was obtained from all participants, who were informed that their involvement was voluntary and that they had the right to withdraw from the study at any time. Any data collected during the survey were confidential and used solely for research purposes.

Participants in the study were interviewed while attending the diabetic clinic at the students' hospital. The diabetes clinic provides services for diabetic students twice weekly (Sunday and Wednesday) from 9 a.m. to 2 p.m. Approximately five people were enrolled daily.

Eligible participants were interviewed through a structured, self-administered questionnaire.

The questionnaire was divided into three sections. The initial section gathered primary identification data such as age, gender, and faculty.

The second section of the questionnaire was for the assessment of DD using the valid DDS17 (Diabetes Distress Scale 17). The DDS17 was developed by Polonsky et al. and aims to evaluate distress across four domains: Emotional burden, Physician-related distress, Regimen-related distress, and Interpersonal distress. [8]

This section consisted of 17 potential problem areas that individuals with diabetes may encounter. Participants were asked to rate the degree to which each item was bothersome in their lives rather than whether it was simply true.

The rating scale ranged from "Not a problem" (scored 1) to "A severe problem" (scored 6), with various levels of problem severity in between (a slight problem, a moderate problem, a somewhat serious problem, a severe problem).

For scoring purposes, the sum of the patient's responses to the items was divided by the total number of items in the scale. A mean item score of three or higher indicated distress at a level worthy of clinical attention.

The third section of the questionnaire assessed the quality of life of diabetic patients with DD. It utilized a pre-designed questionnaire called the "Diabetes Quality of Life Instrument," developed by Bujang *et al.*[9]. This instrument consists of twenty-one items in three domains: satisfaction, impact, and worry.

Questionnaires were translated into Arabic and validated by two medical doctors and one English-Arabic bilingual translator using a state-of-the-art forward-backward translation procedure.

A pilot study was conducted on 20 patients, but they were later excluded from the primary research due to adjustments made to the language and arrangements of the questions. Cronbach's alpha, which was 0.936, checked the reliability of the questionnaire, which indicates a high level of internal consistency for the scale.

All patients with DD received sessions of a coping skill program and were reevaluated by DDS & DQOL instruments three months after the beginning of the study, and another HbA1c level was assessed.

The three sessions of coping skills training included the following elements: In the first session, the interventionist introduced herself to the participants, and then the participants introduced themselves. After that, the participants were presented with the content of coping skills training. This session also covered other topics such as Recognizing the disease (providing information about diabetes, including its causes, symptoms, and management), Principles of self-care (discussing the impact of the disease on nutrition and physical activity, as well as preventive measures such as infection prevention, vaccination, and medication).

In the second session, the focus was on stress management. The participants had the opportunity to share their thoughts and emotions related to diabetes, including symptoms and complications. They were then provided information about psychosomatic symptoms of stress, factors contributing to increased stress levels, strategies to reduce stress, and techniques to enhance self-esteem.

The session also included cognitive-behavioral modification and social training, which involved helping the participants modify their internal dialogue to adopt a more positive attitude. They were taught to reflect on their thoughts and learn practical ways to respond to various situations. Additionally, the session covered communication skills training, specifically targeting social skills development.

The content of the third session of the training program included problem-solving techniques. The interventionist introduced the concept of problem-solving, explained the different stages involved in problem-solving, and emphasized its significance in managing and coping with stress.

Specifically, six steps of problem-solving were outlined during this session. In the final part of the session, the interventionist welcomed feedback from the participants, addressed any questions they had, and provided a summary of the entire training program.

Statistical analysis

Data were analyzed using SPSS (i.e., statistical package for social sciences) program version 20 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp).

Numerical data were expressed as mean ± SD. Qualitative data were expressed as frequency and percentage. Statistical relationships between parametric qualitative variables were tested using $\chi 2$, and between quantitative variables were tested using the Student t-test.

Pearson's correlation was used to determine the correlation between parametric quantitative variables, and the Wilcoxon signed-rank test (Z), a non-parametric test, was used to determine the differences between two dependent samples. The Shapiro-Wilk test has a p-value of 0.005, and the histogram is negatively skewed, so a paired t-test is inappropriate.

A Wilcoxon signed rank test was used instead. The results were represented in tables and graphs. The significance level was considered statistically significant if (P value is <0.05).

Results

The study involved 130 patients with a mean age of 20.26 ±1.778 years. Among the participants, about half of them (50.8%) suffered from DD. It was found to be more prevalent among students in practical faculties than those in theoretical faculties, and the difference between the two groups was statistically significant. (Figure 1)

There was a statistically significant impact of DD on QOL of type 1 diabetic patients, mainly in the domains of satisfaction and worry. (Table 1)

After the implementation of coping skill training, there was a significant improvement in the total DDS and its four domains among the studied patients (Table 2). There was also a substantial improvement in the quality of life among the studied patients after the program's

implementation, with a p-value of less than 0.001. (Table 3)

There was a significant positive correlation between DDS and Hemoglobin A1c (HbA1c), indicating that higher levels of diabetes-related distress are associated with higher HbA1c (poor glycemic control). (Figure 2a)

The average HbA1c level in the study group decreased following the implementation of coping skill training (7.72±2.266), as compared to the average HbA1c level before the intervention (8.458±2.502).(Figure 2b)

Discussion

Diabetes distress is a significant problem that affects people with type one diabetes mellitus (T1DM) and can have negative impacts on their physical and mental health outcomes.

The present study revealed that the prevalence of DD among the study group was 50.8%, and it was more prevalent among students in practical faculties than those in theoretical ones. This may be due to the lifestyle Demands of practical faculties, which involve hands-on training and fieldwork and may require a more structured routine.

Also, managing diabetes can be challenging due to irregular schedules, limited access to food, and increased physical demands. These factors can also contribute to higher levels of stress.

This was agreed with another study that also used DDS-17 and was conducted at the University of Nigeria Teaching Hospital Enugu, which showed that the prevalence of DD in the studied population was 51.9%. [6]

Another study conducted in Saudi Arabia that also used DDS-17 found that 53% of T1 DM Saudi patients had diabetes distress. [10]

This was different from the Fisher *et al.* [11] study, which found that 41.6 % of Canadian adults with T1DM experience diabetes distress.

They used another developed assessment instrument with a profile of seven significant sources of DD among T1D. Another study published by Sturt *et al.*[12] found that only up to 30% of adults with T1DM experience diabetes distress, which was different from the current study.

This may be attributed to the differences in the age of the studied patients, as younger individuals with diabetes, including adolescents and young adults, are more likely to experience diabetes distress than older individuals.

The present study revealed a significant negative correlation between diabetes distress score and total quality of life score, indicating that DD significantly affects the quality of life of diabetic patients.

These findings are consistent with a study conducted by Chew *et al.* [13] in Malaysia, which used The World Health Organization Quality of Life-Brief (WHOQOL-BREF) and demonstrated a negative relationship between diabetes distress score and quality of life.

The study demonstrated a notable disparity between the pre-intervention and post-intervention stages among patients with DD who received coping skills training ,indicating the impact of coping skills on the management of DD and the improvement of HbA1c results .

This is consistent with a study by Edraki *et al.*[7] that was performed in the diabetes clinic in Iran using the same tools for the DDS assessment and discovered that coping skills training decreased distress and anxiety levels and enhanced self-efficacy in adolescents with type 1 diabetes once they completed the intervention.

Several meta-analyses have compared the efficacy of a program that combined coping skills training with diabetes self-management training to standard diabetes education, and the results showed a decrease in diabetes distress after 3 months and, even more impressively, a reduction in systolic blood pressure, cholesterol, and HbA1c levels. [14]

Sturt *et al.* [12] also suggested that interventions aimed at reducing diabetes distress have improved HbA1c, as a marginally significant trend indicates a relationship between changes in distress and changes in HbA1c.

In terms of QOL, the present study found a notable improvement following the implementation of coping skills training, which is agreed with a survey by Knowles *et al.* [15] in Australia, while another study in New York by Hoogendoorn et al. [16] viewed DD as a singular factor that hardly influences the multifaceted concept of quality of life.

Conclusion: Diabetes distress is prevalent among T1DM patients. A notable relation exists between DD, quality of life, and glycemic control. Participating in coping skills training has been shown to be beneficial in reducing diabetes distress, improving quality of life, and enhancing glycemic control.

Study limitations: a small sample size, lengthy questionnaire, and difficulty in recalling past medical history, especially

during their childhood period and family history.

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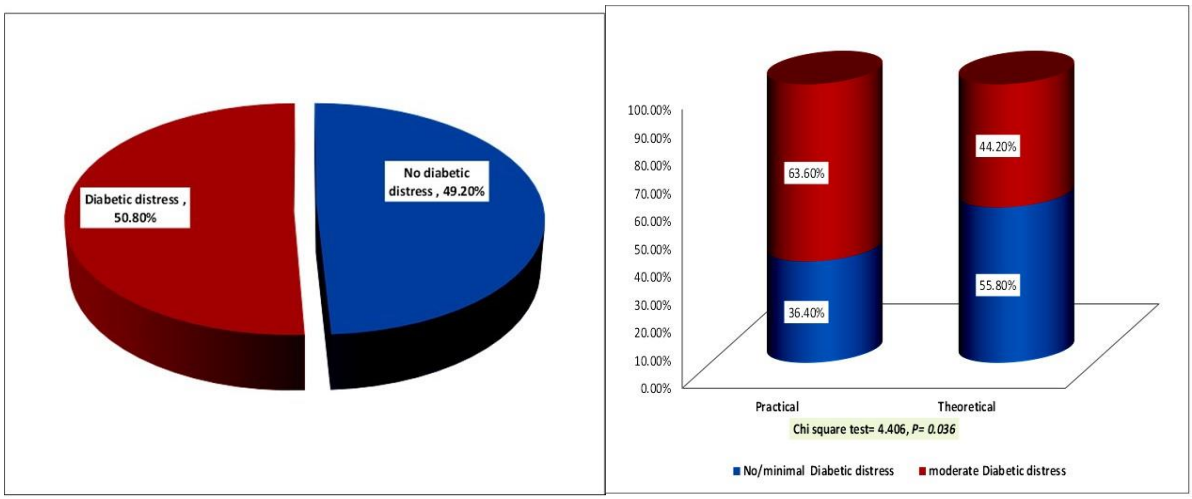

Figure 1: The prevalence of diabetes distress among studied patients (1a) and the Distribution of Diabetes distress among students of practical and theoretical faculties (1b).

Table 1: Impact of diabetes distress on the quality of life (QOL) among the studied patients

Parameter	DDS		t- Test	P value
	No diabetic distress	Diabetic distress		
	NO 72 (55.4%)	NO 58 (44.6%)		
Satisfaction domain Mean ± SD	50.133±14.709	60.34±14.37	4.002	<0.001
Impact domain Mean ± SD	54.89±11.68	58.58±11.06	1.848	0.067
Worry domain Mean ± SD	56.56±16.22	63.86±17.23	2.488	0.014
Total quality of life score Mean ± SD	53.86±9.04	60.93±10.23	4.176	<0.001

Table 2: Compares the diabetes distress scores of the studied patients before and after applying the coping skills program.

Parameter	Study group		Chi-square test	P value
	Pre-Intervention	Post-intervention		
	No 66 (%)	No 66 (%)		
Total diabetes distress			18.051	P= <0.001
Diabetic distress	39(59.0)	15(22.7)		
No diabetic distress	27(41.0)	51(77.3)		
Emotional burden			8.923	P= 0.002
Diabetic distress	37(56.1)	20(30.3)		
No diabetic distress	29(43.9)	46(69.7)		
Physician related distress			11.416	P= <0.001
Diabetic distress	51(77.3)	18(27.3)		
No diabetic distress	15(22.7)	22(72.7)		
Regimen related distress			8.923	P= 0.002
Diabetic distress	37(56.1)	20(30.3)		
No diabetic distress	29(43.9)	46(69.7)		
Interpersonal distress			52.394	P= <0.001
Diabetic distress	48(72.7)	7(10.6)		
No diabetic distress	18(27.3)	59(89.4)		

Table 3: Comparison between the studied patients' quality of life before and after applying the coping skills program.

Parameters	Pre-intervention	Post-intervention	Wilcoxon signed ranks test	P value
	Mean ± SD Min- Max.	Mean ± SD Min- Max.		
Satisfaction domain	51.42±15.57 28.57-71.43	37.14±15.29 16.67-69.05	3.466	**0.001**
Impact domain	56.33±10.33 27.78-66.67	36.48±12.87 16.67-61.11	4.422	**<0.001**
Worry domain	63.5±17.24 29.17-81.25	38.89±12.11 18.75-60.42	4.64	**<0.001**
Total quality of life score	57.08±10.26 28.57-73.81	37.61±10.98 20.63-59.52	4.638	**<0.001**

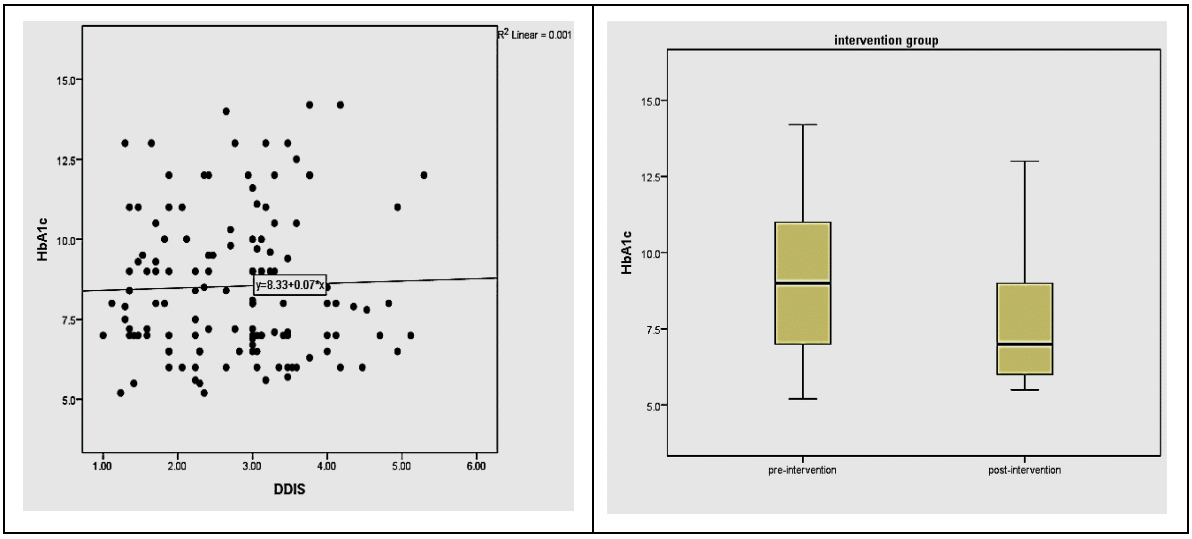

Figure 2 : Correlations between diabetes distress score and hemoglobin A1c level in the studied patients (r=0.190, P=0.030) (2a); Comparison of the level of hemoglobin A1C among the studied patients before and after intervention (2b).

الملخص العربي

توتر السكري بين طلبة الجامعة المصابين بالسكري من النوع الاول في مصر

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الاهداف: لتقييم تأثير توتر السكري على جودة الحياة والتحكم في مستوى السكر في الدم لدى طلاب جامعة المنوفية المصابين بالسكري من النوع الاول، ولتقييم تأثير تدريب مهارات التكيف على توتر السكري وجودة الحياة والتحكم في مستوى السكر في الدم. **الخلفية**: يؤثر التوتر السكري على الصحة الجسدية والعقلية.لمرضي السكري من النوع الاول الذي يعد مرض مناعي مزمن يحتاج الي مراقبة مستمرة للسكر في الدم وإعطاء الأنسولين و نمط حياة خاص و كل هذا يؤدي إلى الشعور بالقلق. **طرق البحث:** تمت هذه الدراسة المقطعية علي طلاب جامعة المنوفية المصابين بالسكري من النوع الاول و تم تقييمهم من خلال استبيان تم تنفيذه ذاتيًا، وقياس السكر التراكمي و تدريب المرضى الذين يعانون من توتر السكري (٦٦ مريضًا) علي مهارات التكيف وإعادة التقييم بعد ثلاثة أشهر. **النتائج**: شملت الدراسة الحالية ١٣٠ مريضًا بمتوسط عمر يبلغ ٢٠,٢٦ سنة و بينت انتشار توتر السكري بين المرضي بنسبة ٥٠,٨٪ ومتوسط السكر التراكمي ٨,٥٤ و تحسن التوتر السكري و جودة الحياة مستوى السكر في الدم بعد تنفيذ تدريب مهارات التكيف على المرضى . **الاستنتاج**: يعتبر توتر السكري منتشرًا بين مرضى السكري من النوع الاول و قد اثرت مهارات التكيف إيجابيًا على توتر السكري وجودة الحياة والتحكم في مستوى السكر في الدم.