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RESEARCH ARTICLE

Impact of Educational Program Regarding Mental Health among Sample of Type-I Diabetes Mellitus Children

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Abstract: ***Background***: Children with type 1 diabetes face many stressors and challenges because of their chronic illnesses. They struggle to cope with diabetes in the early stages with frequent experiences of feelings of sadness, withdrawal, and anxiety. Objectives: To assess the impact of an educational program regarding mental health of type 1 DM children and to find out if there is any association between the mental health of T1DM children and studied variables. ***Methods:*** A quasi-experimental study design conducted at Children Welfare Teaching Hospital and Central Teaching Hospital of Pediatrics in Baghdad along six months duration. It included 45 children with type 1 diabetes whom recently started treatment. An educational program was implemented for parents of these children to promote children's mental health and reduce symptoms of depression and anxiety. PHQ-9 measuring the severity of depression while GAD-7 was used to assess anxiety level before and the intervention. ***Results:*** Before interventions, 66.7% of children had severe anxiety and 22.2% had severe depression. After intervention, 4.4% had severe anxiety and 11.1% had severe depression. The severity of both anxiety and depression were significantly higher among children with low SES, who suffered from traumatic events, with family history of mental disorders, didn't receive psychological support and had diabetes for ≥ 5 years. Conclusion: The educational program implemented for the parents of type 1 diabetic patients is effective in reducing anxiety and depression levels among T1DM children.

Keywords: Anxiety, Depression, Mental health, T1DM, Educational intervention

INTRODUCTION

Type 1 diabetes mellitus (T1DM) is a T-cell-mediated autoimmune disease in which destruction of pancreatic β-cells causes insulin deficiency, which leads to hyperglycemia and a tendency to ketoacidosis. Patients with T1DM constitute 5-10% of all people with diabetes, the remainder having type 2 DM, monogenic forms of DM, or DM associated with other sources of islet cell injury. Most pediatric patients with DM have type 1 and a lifetime dependence on exogenous insulin [1, 2] . With insulin replacement, TIDM is a chronic disease requiring intensive effort on the part of the person with DM and caregivers. Patient and family education is key, as is an acknowledgment of the normal developmental stages and the challenges this brings in the context of daily living with a chronic disease. With proper care and support, children and adolescents with TIDM can expect to lead long and fulfilling lives [3, 4].There is increasing worldwide interest in the impact of T1DM on mental health and quality of life,with additional focus on the influence that this comorbidity might have on adherence to treatment and, consequently, on its effectiveness [5]. Children with T1DM face many stressors and challenges as a result of their chronic illnesses, the need for daily administration of insulin, and management of complex medical conditions which require daily completion of multiple self-care behaviors which imposes problems of the diabetic child on social interactions with family members, peers, and teachers, and the interference of daily activities due to symptoms of DM and complications like hypoglycemia [6]. Diabetic children struggle to cope with DM in the early stages with frequent experiences of feelings of sadness, withdrawal, and anxiety. More than a third of children developed psychiatric disorders in the 1st decade after the onset of DM. The most typical psychiatric disorders are depression, anxiety, and behavioral disorders. Disturbed eating behaviors are common in girls, which include bulimia nervosa, binge eating disorder, and rarely anorexia nervosa [7] Reports from Sweden and Germany revealed that the prevalence of psychiatric disorders in diabetic children was 8.3% and 33.3%, respectively [8]. An Ethiopian study in 2024 concluded that the prevalence of psychiatric problems among children with T1DM was high, and those children not living with both parents, fathers' level of education, glycemic control, family history of DM, and family size were found to have a significant association with the occurrence of the psychiatric problems [9].Young children often experience stress navigating their social environments, including family, school, and friendships. Chronic illnesses like DM further amplify stress during these stages, and it is rare for children and adolescents with DM not to report experiencing stress [10]. Managing DM, handling family conflicts related to diabetes care, and coping with the emotional burden of the disease are significant sources of stress [11]. Children and families who use adaptive coping strategies such as problem-solving have a better QoL and family functioning, and report fewer depressive and anxiety symptoms [12] Maladaptive coping strategies such as

avoidance are associated with more significant DM-specific distress and suboptimal DM management, including fewer glucose checks and less frequent self-care behaviors [13]. Evidence-based interventions for children with DM, including cognitive behavioral therapy, parental involvement, goal setting, and problem-solving, can foster resilience and reduce stress. Additionally, strategies to minimize family conflict and enhance social support for parents and caregivers should be integrated into clinical care to improve overall well-being [14]. Overall, psychiatric disorders are associated with abnormal self-management (e.g., insulin-manipulation) and lower QoL [15]. A maladaptive family environment (e.g., lack of family mealtime structure, parent–child relationship quality) together with parents' eating attitudes (e.g., weight/shape concerns) and habits (e.g., attempts at weight loss) and negative comments about their child's weight are essential when it comes to DEB in their children [16]. Within-person increases in depressive symptoms over six months were associated with concurrent declines in glycemic management. However, 3- to 5-year longitudinal studies in adolescents and young adults with T1DM did not show significant within-person associations between fluctuations in depressive symptoms and glycemic management changes [17]. Anxiety symptoms and disorders: Generalized anxiety is described as “free-floating” with continual symptoms and no specific focus. There is substantial comorbidity between anxiety and depression. As a counter to chronic uncomfortable feelings of anxiety, a person will compensate by avoiding as many stressful experiences as possible. The highest risk is for those with DM between the ages of 10 and 14 years, and long diabetes duration [18]. Children with DM and anxiety disorders are at risk for suboptimal glycemic outcomes, more hospitalizations, suboptimal self-management, lower QoL, more depressive symptoms, and higher family conflict than peers with DM without anxiety disorders [19] In addition to lower IQ, youth with diabetes are at risk for specific neurocognitive deficits such as information processing difficulties (attention, memory, processing speed), learning disabilities, and problems with executive functions (goal-oriented behavior and other key skills for self-management such as planning, problem-solving, and organization) [20,21]. Hypoglycemia, hyperglycemia, and DKA, especially if recurrent, can impact school functioning and educational attainment via a combination of mechanisms, including altered cognitive function and non-attendance for acute treatment. However, findings regarding the impact of T1DM on academic performance in young people are mixed [22].Parenting a child or adolescent with T1DM presents significant challenges, often leading to high levels of stress, anxiety, and even depression in parents. Managing their child's condition requires constant monitoring of blood glucose levels, insulin administration, dietary control, and handling the emotional impact of a chronic illness [23, 24]. Parenting interventions have been developed to support parents, improve coping strategies, and ultimately enhance the well-being of both parents and their children. These programs focus on education, emotional support, problem-solving, and fostering positive interactions within the family [25]. These programs aim to educate parents about T1DM, its management, and the psychological impact it can have on both parents and children. They provide knowledge on insulin therapy, carbohydrate counting, exercise effects, and hypoglycemia management. Additionally, they teach stress management techniques to help parents cope with the demands of caregiving [26]. Family-based interventions show improved psychosocial outcomes for youth and families, such as reducing family conflict and improving parent–child relationships, but mixed results for glycemic outcomes [27]. Family-based interventions include goal setting, problem-solving, self-monitoring, parental praise for regimen-related behaviors, use of behavioral contracts, clear and consistent parental communications, and appropriately shared responsibility for diabetes management tasks. Behavioral family systems therapy with diabetes-specific tailoring reduced family conflict and improved ability to be consistent with treatment plans, with improved glycemic management over 18 months, employing improved parent-adolescent communication and problem-solving [28]. It is crucial to provide psychosocial interventions during the period after diagnosis, as this is a stressful time for the child and the family. Several interdisciplinary programs for newly diagnosed children have been reported to improve child and parental outcomes [29].

Objectives:

1. To assess the impact of educational program on mental health of T1DM children.
2. To find out if there is any association between the mental health of T1DM children and studied variables

Patients and Methods:

Study design: This was a quasi-experimental study design. The study was conducted at Children Welfare Teaching Hospital (Pediatric Endocrinology Consultant) and Central Teaching Hospital of Pediatrics / Al-Karkh Health Department. This study was extended from 1st of February to 30th of September 2025. Collection of samples was extended to two months.

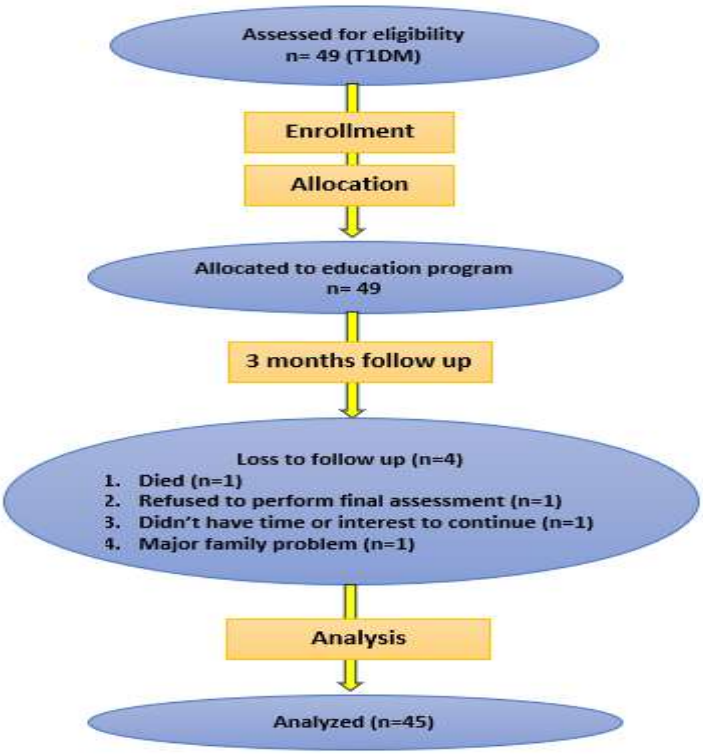
Sample size and sampling techniques: A convenience sampling technique was used to select 45 children with T1DM attending the selected hospitals.

Inclusion criteria: Children aged between 11 and 14 years were known cases of T1DM (Children who have been diagnosed with T1DM for more than six months).

Exclusion criteria: Children with severe pre-existing mental disorders, Children who are newly diagnosed with T1DM, Parents or children have refused to participate in the study.

RESULTS

The sample then had been modified according to the following graph:



Flow chart of the study

Data collection methods: Data had been collected by self-administered questionnaire; provided directly to the parents which was filled by the researcher and collected upon completion including the following parts:

Studied variables: Age of patients, Age of parents, Gender, Number and sequence of children, Socio economic status (SES):

SES = Education + Occupation + House ownership * 0.5 + Car ownership * 0.1 + (age-20)/100 – Retired/unemployed/deceased.

The calculated SES score can be divided into three equal parts: Low (< 5), Middle (5 – 10), High (> 10). [30]

History of chronic and mental disorders, Family history of diabetes and mental disorders, Regularity of diabetes follows up, Psychological support or counseling, History of traumatic events, Problem-solving ability, Communication difficulty, Duration of T1DM

2. *Generalized Anxiety Disorder-7 (GAD-7)*: [31]

Minimal Anxiety (Score 0-4), Mild Anxiety (Score 5-9), Moderate Anxiety (Score 10-14)
Severe Anxiety (Score 15 or greater)

3. Patient Health Questionnaire-9 (PHQ-9). It is a validated multipurpose instrument for screening, diagnosing, monitoring and measuring the severity of depression (Educational program) as "0" (not at all) to "3" (nearly every day) and the total score would be ranged from 0 to 27. Depression severity was characterized as none (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (≥ 20) [32].

Educational program

The research questionnaire has been delivered along with a complete explanation of the research objectives, and a written approval has been obtained from the parents .a group has been created on social media to answer inquiries from the parents, the scales had been prepared. The educational program included 41 participants, at the beginning: all patients were evaluated using the GAD-7 and PHQ-9 scales, the program was for parents with T1DM to promote children's mental health and reduce symptoms of depression and anxiety, it constitutes sessions about: Dangerous and life-threatening complications of T1DM, The relationship between T1DM and psychological disorders. Lifestyle modifications for children with T1DM [33, 34]. Education on self-care for diabetics and managing anxiety and depression. Education on the management of mental disorders, then Re-evaluation was done for the depression and anxiety scales (GAD-7 and PHQ-9) after the educational program (After three months).

Ethical considerations and official approvals

Informed consent was obtained before performing the intervention to ensure that the participants and their parents have fully agreed. Administrative approvals were granted from the following, in addition to approval of the Scientific Council of Family and Community Medicine / Iraqi Board for Medical Specializations, letter of facilitation of data collection was directed from MOH to the affiliated hospitals (Children Welfare Teaching Hospital, Pediatric Endocrinology Consultant and Central Teaching Hospital of Pediatric / Al-Karkh Health Department)

Statistical analysis: Statistical analysis was performed using SPSS-26. Continuous variables were presented as mean ± standard deviation, while for categorical variables, numbers and percentages were used. The significance of the difference of different means was tested using the Paired-t-test for the difference of paired observations (or two dependent means). The significance of differences of different percentages was tested using the Pearson Chi-square test, with application of Yates' correction or Fisher's Exact test whenever applicable. Statistical significance was considered whenever the P value was less than 0.05.

RESULTS

Socio-demographic characteristics

The age range of the study sample was 11 to 14 years, with a mean of 12.21 ± 1.06 years. More than half of the children were 11 – 12 years, 24 (53.3%), while the remaining 21 (46.7%) were 13 – 14 years, as shown in Figure 3.1.

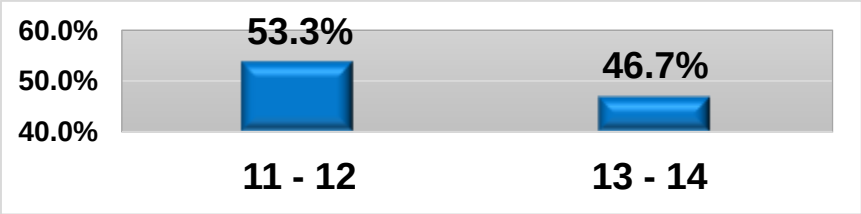


Figure 1: Distribution of the participant children according to age group

Regarding gender, there were 15 males (33.3%) and 30 females (66.7%). Most children in this study were not the only children in their family, 42 (93.3%). The number of children was ≥ 4 in 35 (77.8%), and less than two-thirds of children were third-born or later, 28 (62.2%). All 90 children were cared for by their parents. Mother's age was < 35 years in 27 (60%), while father's age was ≥ 35 in 25 (55.6%) of the study participants. The highest proportion of study participants had an intermediate SES, 16 (37.8 (table 1).

Table 1: Socio-demographic characteristics of the study group

Variable	No. (n= 45)	Percentage (%)
Gender		
Male	15	33.3
Female	30	66.7
Only one child		
Yes	3	6.7
No	42	93.3
Number of children		
1 – 3	10	43.0
≥ 4	35	77.8
Child sequence		
1st	8	17.8
2nd	9	20.0
≥ 3rd	28	62.2
Mother's age (years)		
< 35	27	60.0
≥ 35	18	40.0
Father's age (years)		
< 35	25	55.6
≥ 35	20	44.4
Socioeconomic status		
Low	15	33.3
Intermediate	17	37.8
High	13	28.9

(Table 2) shows the psychosocial and clinical characteristics of the study sample. Out of 45 children, 15 (33.3%) had a history of chronic diseases, 7 (15.6%) had a history of mental disorder, 6 (13.3%) had a family history of mental disorders, and 14 (31.1%) had a family member with DM. Further, regular follow-up for DM, psychological support or counselling, and exposure to traumatic events were reported by 30 (66.7%), 26 (57.8%), and 19 (42.2%), respectively. Problem-solving ability and communication difficulties were reported by 21 (46.7%) and 19 (4.2%), respectively. The mean duration of T1DM was 3.79 ± 2.55 years, and the most common duration was < 5 years in 25 children (55.6%).

Table 2: Baseline psychosocial and clinical characteristics of the study group

Variable	No. (n= 45)	Percentage (%)
History of chronic diseases		
Yes	15	33.3
No	30	66.7
History of mental disorders		
Yes	7	15.6
No	40	84.4
Family history of mental disorders		
Yes	6	13.3
No	40	86.7
Family member with diabetes		
Yes	14	31.1
No	31	68.9
Regular follow-up of T1DM		
Yes	30	66.7
No	15	33.3
Psychological support or counseling		
Yes	26	57.8
No	19	42.2
Traumatic events		
Yes	19	42.2
No	26	57.8
Problem-solving ability		
Yes	21	46.7
No	24	53.3
Communication difficulty		
Yes	19	42.2
No	26	57.8
Duration of T1DM		
< 5	25	55.6
≥ 5	20	44.4

Anxiety: Before psych educational interventions and according to GAD-7 score, 15 children (33.3%) had moderate anxiety, and the remaining 30 (66.7%) had severe anxiety. After interventions, 16 children (36%) had mild anxiety, 27 (60%) had moderate, and only 2 (4.4%) had severe anxiety (fig 2)

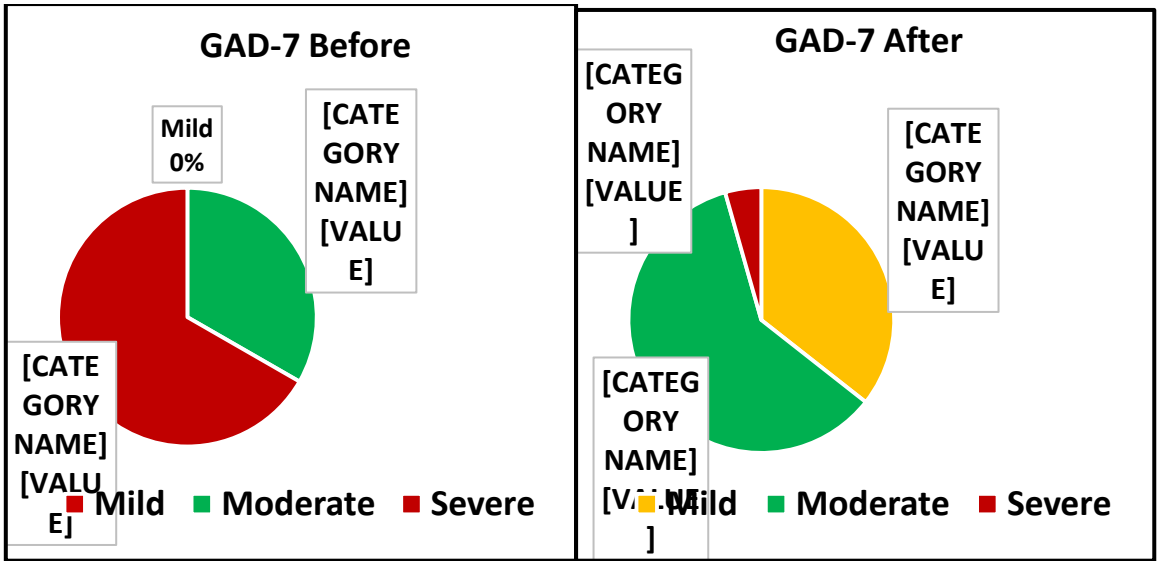


Figure2: Distribution of the study children according to GAD-7 score before and after psychosocial interventions

There was a significant difference in the mean GAD-7 score of the study children before and after psychosocial interventions. GAD-7 scores significantly decreased from 16.48 before interventions to 10.44 after interventions, P < 0.001, (table 3).

Table 3: Comparison between GAD-7 scores before and after psychosocial interventions

GAD-7 scores	Before intervention Mean ± SD	After intervention Mean ± SD	Paired t-test	P-value
	16.48 ± 3.91	10.44 ± 2.33	**9.325**	**< 0.001**

This study found a statistically significant association (P < 0.05) between anxiety level before interventions and the number of children and SES. The rates of severe anxiety were significantly higher among children whose family had ≥ 4 children (74.3%, P = 0.042) and children with low SES (86.7%, P = 0.023). Other variables showed no significant association (P ≥ 0.05) with anxiety level (table 4).

Table 4: Sociodemographic characteristics of the study group classified according to anxiety level before interventions

Variable	GAD-7 scores before intervention		Total (%) n= 45	P - value
	Moderate (%) n= 15	Severe (%) n= 30		
Age groups (Years)				
11 – 12	7 (29.2)	17 (70.8)	24 (53.3)	**0.526**
13 – 14	8 (38.1)	13 (61.9)	21 (46.7)	
Gender				
Male	6 (40.0)	9 (60.0)	15 (33.3)	**0.502**
Female	9 (30.0)	21 (70.0)	30 (66.7)	
Number of children				
1 – 3	6 (60.0)	4 (40.0)	10 (22.2)	**0.042**
≥ 4	9 (25.7)	26 (74.3)	35 (77.8)	
Child sequence				
1st	4 (50.0)	4 (50.0)	8 (17.8)	**0.525**
2nd	3 (33.3)	6 (66.7)	9 (20.0)	
≥ 3rd	8 (28.6)	20 (71.4)	28 (62.2)	
Mother's age (years)				
< 35	6 (22.2)	21 (77.8)	27 (60.0)	**0.053**

≥ 35	9 (50.0)	9 (50.0)	18 (40.0)	
Father's age (years)				
< 35	7 (35.0)	13 (65.0)	20 (44.4)	**0.832**
≥ 35	8 (32.0)	17 (68.0)	25 (55.6)	
Socioeconomic status				
Low	2 (13.3)	13 (86.7)	15 (33.3)	**0.023**
Intermediate	5 (29.4)	12 (70.6)	17 (37.8)	
High	8 (61.5)	5 (38.5)	13 (28.9)	

On the other hand, the rates of severe anxiety were significantly higher among children who didn't receive psychological support or counselling (84.2%, P = 0.032), children who suffered from traumatic events (89.5%, P = 0.005), and children who had diabetes for ≥ 5 years (85%, P = 0.019), (table 5).

Table 3.5: Psychosocial and clinical characteristics of the study group classified according to anxiety level before interventions

Variable	GAD-7 scores before intervention		Total (%) n= 45	P - value
	Moderate (%) n= 15	Severe (%) n= 30		
History of chronic diseases				
Yes	6 (40.0)	9 (60.0)	15 (33.3)	**0.504**
No	9 (30.0)	21 (70.0)	30 (66.7)	
History of mental disorders				
Yes	3 (42.9)	4 (57.1)	7 (15.6)	**0.56**
No	12 (31.6)	26 (68.4)	38 (84.4)	
Family history of mental disorders				
Yes	4 (66.7)	2 (33.3)	6 (13.3)	**0.063**
No	11 (28.2)	28 (71.8)	39 (86.7)	
Family member with diabetes				
Yes	6 (42.9)	8 (57.1)	14 (31.1)	**0.362**
No	9 (29.0)	22 (71.0)	31 (68.9)	
Regular follow-up of T1DM				
Yes	12 (40.0)	18 (60.0)	30 (66.7)	**0.18**
No	3 (20.0)	12 (80.0)	15 (33.3)	
Psychological support or counseling				
Yes	12 (46.2)	14 (53.8)	26 (57.8)	**0.032**
No	3 (15.8)	16 (84.2)	19 (42.2)	
Traumatic events				
Yes	2 (10.5)	17 (89.5)	19 (42.2)	**0.005**
No	13 (50.0)	13 (50.0)	26 (57.8)	
Problem-solving ability				
Yes	9 (42.9)	12 (57.1)	21 (46.7)	**0.205**
No	6 (25.0)	18 (75.0)	24 (53.3)	
Communication difficulty				
Yes	7 (36.8)	12 (63.2)	19 (42.2)	**0.669**
No	8 (30.8)	18 (69.2)	26 (57.8)	
Duration of T1DM				
< 5	12 (48.0)	13 (52.0)	25 (55.6)	**0.019**
≥ 5	3 (15.0)	17 (85.0)	20 (44.4)	

Comparison of anxiety scores before and after psychosocial interventions according to SD characteristics of children revealed that there was a significant reduction in anxiety scores after interventions regarding all sociodemographic characteristics, as shown in table (3.6).

Table 6: Comparison of GAD-7 scores before and after interventions according to sociodemographic characteristics

Variable	Category	GAD-7 scores		P –value
		Before	After	
Age groups (Years)	**11 – 12**	16.62 ± 3.94	9.75 ± 1.77	**0.001**
	13 – 14	16.33 ± 3.96	11.23 ± 2.66	**0.001**
Gender	**Male**	17.2 ± 4.53	10.93 ± 1.75	**0.001**
	Female	16.13 ± 3.58	10.2 ± 2.56	**0.001**
Number of children	**1 – 3**	14.9 ± 4.88	10.6 ± 1.5	**0.027**
	≥ 4	16.94 ± 3.53	10.4 ± 2.54	**0.001**
Child sequence	**1st**	15.5 ± 5.06	10.75 ± 1.66	**0.025**
	2nd	14.88 ± 2.57	11.02 ± 3.66	**0.008**
	≥ 3rd	15.11 ± 3.09	9.09 ± 3.13	**0.001**
Mother's age (years)	**< 35**	15.72 ± 4.55	9.66 ± 1.32	**0.002**
	≥ 35	17.01 ± 3.39	10.96 ± 2.71	**0.001**
Father's age (years)	**< 35**	16.79 ± 4.4	10.12 ± 2.48	**0.001**
	≥ 35	16.0 ± 3.22	10.85 ± 1.95	**0.001**
Socioeconomic status	**Low**	15.93 ± 4.26	11.0 ± 2.47	**0.003**
	Intermediate	14.98 ± 3.96	9.52 ± 1.41	**0.01**
	High	18.15 ± 3.1	11.12 ± 2.85	**0.001**

Similarly, there was a significant reduction in anxiety score after interventions regarding all psychosocial and clinical characteristics of the study group, (table 7).

Table 7: Comparison of GAD-7 scores before and after interventions according to psychosocial and clinical characteristics

Variable	Category	GAD-7 scores		P -value
		Before	After	
History of chronic diseases	**Yes**	16.53 ± 3.68	10.53 ± 2.38	**0.001**
	No	18.01 ± 4.08	9.4 ± 2.34	**0.001**
Family history of mental disorders	**Yes**	15.57 ± 4.23	11.0 ± 3.46	**0.011**
	No	16.47 ± 3.9	10.42 ± 2.1	**0.001**
Family history of mental disorders	**Yes**	14.5 ± 2.66	9.65 ± 2.25	**0.004**
	No	16.79 ± 4.0	10.56 ± 2.34	**0.001**
Family member with diabetes	**Yes**	15.92 ± 3.7	12.01 ± 2.73	**0.032**
	No	16.72 ± 4.03	10.29 ± 2.03	**0.001**
Regular follow-up of T1DM	**Yes**	15.96 ± 3.96	11.23 ± 2.09	**0.009**
	No	17.35 ± 3.7	10.86 ± 2.77	**0.001**
Psychological support or counseling	**Yes**	16.65 ± 3.69	9.65 ± 2.84	**0.001**
	No	14.81 ± 4.27	10.15 ± 1.38	**0.004**
Traumatic events	**Yes**	15.93 ± 4.26	11.0 ± 2.47	**0.003**
	No	14.98 ± 3.96	9.52 ± 1.41	**0.01**
Problem-solving ability	**Yes**	17.1 ± 3.88	10.15 ± 1.97	**0.001**
	No	13.95 ± 3.94	9.65 ± 2.54	**0.012**
Communication difficulty	**Yes**	19.01 ± 3.21	13.02 ± 2.45	**0.001**
	No	17.41 ± 4.28	10.25 ± 2.25	**0.001**
Duration of T1DM	**< 5**	15.68 ± 3.54	12.42 ± 2.51	**0.024**
	≥ 5	17.07 ± 4.12	10.46 ± 2.21	**0.001**

Depression

Before psycho-educational interventions and according to children's responses to the PHQ scale, 4 (8.9%) had mild depression, 31(68.9%) had moderate depression, and the remaining 10 (22.2%) had severe depression. After interventions, 23 children (51.1%) had mild depression, 17 (37.8%) had moderate, and 5 (11.1%) had severe depression, (figure 3)

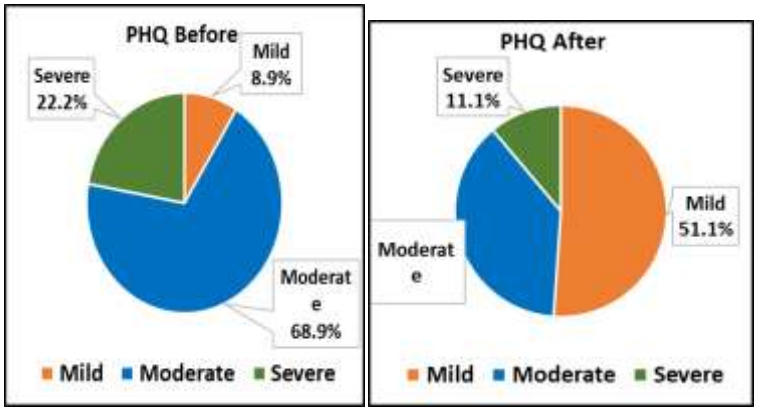


Figure 3.3: Distribution of the study children according to PHQ score before and after psychosocial interventions

There was a significant reduction in the mean PHQ score from 18.33 before interventions to 11.77 after interventions, P < 0.001, (table 8).

Table 8: Comparison between PHQ scores before and after psychosocial interventions

PHQ scores	Before intervention Mean ± SD	After intervention Mean ± SD	Paired t-test	P-value
	18.33 ± 5.22	11.77 ± 4.03	**9.325**	**< 0.001**

In the present study, 46.7% of children with low SES had severe depression, with a statistically significant association (P < 0.018) between depression level before interventions and SES. Other variables showed no significant association with depression level, as shown in (table 9).

Table 9: Sociodemographic characteristics of the study group classified according to depression level before interventions

Variable	PHQ score before intervention		Total (%) n= 45	P value
	Mild Mod. (%) n= 35	Severe (%) n= 10		
Age groups (Years)				
11 - 12	18 (75.0)	6 (25.0)	24 (53.3)	**0.632**
13 – 14	17 (81.0)	4 (19.0)	21 (46.7)	
Gender				
Male	10 (66.7)	5 (33.3)	15 (33.3)	**0.205**
Female	25 (83.3)	5 (16.7)	30 (66.7)	
Number of children				
1 – 3	9 (90.0)	1 (10.0)	10 (22.2)	**0.292**
≥ 4	26 (74.3)	9 (25.7)	35 (77.8)	
Child sequence				
1st	7 (87.5)	1 (12.5)	8 (17.8)	**0.754**
2nd	7 (77.8)	2 (22.2)	9 (20.0)	
≥ 3rd	21 (75.0)	7 (25)	28 (62.2)	
Mother's age (years)				
< 35	12 (66.7)	6 (33.3)	18 (40.0)	**0.143**
≥ 35	23 (85.2)	4 (14.8)	27 (60.0)	
Father's age (years)				
< 35	15 (75.0)	5 (25.0)	20 (44.4)	**0.688**

≥ 35	20 (80.0)	5 (20.0)	25 (55.6)	
Socioeconomic status				
Low	8 (53.3)	7 (46.7)	15 (33.3)	**0.018**
Intermediate	15 (88.2)	2 (11.8)	17 (37.8)	
High	12 (92.3)	1 (7.7)	13 (28.9)	

Higher depression rates were seen among children who had a family history of mental disorders (83.3%, P < 0.001), children who didn't receive psychological support or counselling from their families (42.1%, P = 0.006), and children who had diabetes for ≥ 5 years (45%, P = 0.001), (table10).

Table 3.10: Psychosocial and clinical characteristics of the study group classified according to depression level before interventions

Variable	PHQ score before intervention		Total (%) n= 45	P - value
	Mild / Moderate (%) n= 35	Severe (%) n= 10		
History of chronic diseases				
Yes	12 (80.0)	3 (20.0)	15 (33.3)	**0.798**
No	23 (76.7)	7 (23.3)	30 (66.7)	
History of mental disorders				
Yes	7 (100.0)	0 (0)	7 (15.6)	**0.124**
No	28 (73.7)	10 (26.3)	38 (84.4)	
Family history of mental disorders				
Yes	1 (16.7)	5 (83.3)	6 (13.3)	**< 0.001**
No	34 (87.2)	5 (12.8)	39 (86.7)	
Family member with diabetes				
Yes	12 (85.7)	2 (14.3)	14 (31.1)	**0.389**
No	23 (74.2)	8 (25.8)	31 (68.9)	
Regular follow-up of T1DM				
Yes	23 (76.7)	7 (23.3)	30 (66.7)	**0.798**
No	12 (80.0)	3 (20.0)	15 (33.3)	
Psychological support or counseling				
Yes	24 (92.3)	2 (7.7)	26 (57.8)	**0.006**
No	11 (57.9)	8 (42.1)	19 (42.2)	
Traumatic events				
Yes	15 (78.9)	4 (21.1)	19 (42.2)	**0.872**
No	20 (76.9)	6 (23.1)	26 (57.8)	
Problem-solving ability				
Yes	16 (76.2)	5 (23.8)	21 (46.7)	**0.81**
No	19 (79.2)	5 (20.8)	24 (53.3)	
Communication difficulty				
Yes	15 (78.9)	4 (21.1)	19 (42.2)	**0.871**
No	20 (76.9)	6 (23.1)	26 (57.8)	
Duration of T1DM				
< 5	24 (96.0)	1 (4.0)	25 (55.6)	**0.001**
≥ 5	11 (55.0)	9 (45.0)	20 (44.4)	

The comparison of depression scores before and after psychosocial interventions according to sociodemographic characteristics of children is shown in(table 3.11). After psychosocial education, there was a significant reduction in depression scores across all sociodemographic characteristics of the studied children.

Table 3.11: Comparison of PHQ scores before and after interventions according to sociodemographic characteristics

Variable	Category	PHQ scores		P -value
		Before	After	
Age groups (Years)	**11 - 12**	17.41 ± 3.9	11.41 ± 2.82	**0.001**
	13 – 14	19.38 ± 4.29	12.19 ± 2.5	**0.001**
Gender	**Male**	17.93 ± 3.28	11.26 ± 2.15	**0.001**
	Female	18.53 ± 4.57	12.03 ± 2.9	**0.001**
Number of children	**1 – 3**	17.7 ± 5.16	12.0 ± 3.2	**0.009**
	≥ 4	18.51 ± 3.89	13.71 ± 2.58	**0.011**
Child sequence	**1st**	16.99 ± 4.22	12.50 ± 1.92	**0.022**
	2nd	17.11 ± 4.72	12.77 ± 3.99	**0.015**
	≥ 3rd	18.67 ± 3.71	11.53 ± 2.36	**0.001**
Mother's age (years)	**< 35**	15.38 ± 4.43	12.22 ± 3.11	**0.036**
	≥ 35	16.97 ± 3.92	12.14 ± 2.33	**0.02**
Father's age (years)	**< 35**	18.28 ± 4.18	11.84 ± 2.99	**0.001**
	≥ 35	18.4 ± 4.33	11.7 ± 2.29	**0.001**
Socioeconomic status	**Low**	18.0 ± 3.0	11.8 ± 2.14	**0.001**
	Intermediate	17.22 ± 5.05	13.58 ± 3.6	**0.001**
	High	19.15 ± 3.1	12.0 ± 2.87	**0.001**

At the same time, this study found a significant reduction in depression score after interventions across all psychosocial and clinical characteristics of the study group, (3.12).

Table 12: Comparison of PHQ scores before and after interventions according to psychosocial and clinical characteristics

Variable	Category	PHQ scores		P -value
		Before	After	
History of chronic diseases	**Yes**	16.53 ± 3.68	10.53 ± 2.38	**0.001**
	No	18.01 ± 4.08	9.4 ± 2.34	**0.001**
Family history of mental disorders	**Yes**	15.57 ± 4.23	11.0 ± 3.46	**0.011**
	No	16.47 ± 3.9	10.42 ± 2.1	**0.001**
Family history of mental disorders	**Yes**	14.5 ± 2.66	9.65 ± 2.25	**0.004**
	No	16.79 ± 4.0	10.56 ± 2.34	**0.001**
Family member with diabetes	**Yes**	15.92 ± 3.7	12.01 ± 2.73	**0.032**
	No	16.72 ± 4.03	10.29 ± 2.03	**0.001**
Regular follow-up of T1DM	**Yes**	15.96 ± 3.96	11.23 ± 2.09	**0.009**
	No	17.35 ± 3.7	10.86 ± 2.77	**0.001**
Psychological support or counseling	**Yes**	16.65 ± 3.69	9.65 ± 2.84	**0.001**
	No	14.81 ± 4.27	10.15 ± 1.38	**0.004**
Traumatic events	**Yes**	15.93 ± 4.26	11.0 ± 2.47	**0.003**
	No	14.98 ± 3.96	9.52 ± 1.41	**0.01**
Problem-solving ability	**Yes**	17.1 ± 3.88	10.15 ± 1.97	**0.001**
	No	13.95 ± 3.94	9.65 ± 2.54	**0.012**
Communication difficulty	**Yes**	19.01 ± 3.21	13.02 ± 2.45	**0.001**
	No	17.41 ± 4.28	10.25 ± 2.25	**0.001**
Duration of T1DM	**< 5**	15.68 ± 3.54	12.42 ± 2.51	**0.024**
	≥ 5	17.07 ± 4.12	10.46 ± 2.21	**0.001**

DISCUSSION

Distribution of the study participants according to GAD-7 score before and after educational program interventions:

Before the educational program interventions in this study, and according to GAD-7 score, about two thirds of the participants had severe anxiety, and one third had moderate anxiety, while after interventions, two thirds had moderate anxiety and only 4.4% of children had severe anxiety, with a significant reduction in the mean GAD-7 score of the study children before and after psychosocial interventions. A meta-analysis of randomized psychological therapies by Pascoe and colleagues revealed a moderate immediate reduction in anxiety disorders (SMD −0.30, 95% CI −0.69 to 0.10) and a medium reduction during follow-up (SMD −0.61, 95% CI −0.92 to −0.31). One trial used the GAD-7 as the measurement for anxiety assessment. This indicates that significant decreases in anxiety following intervention program are feasible as measured by the GAD-7 (35). Edraki et, al study was conducted on 100 adolescents with T1DM who were randomly divided into an intervention and a control group, results revealed that educational interventions reduced anxiety and stress and improved the patients' self-efficacy.(36) Recent pediatric T1DM pilots study done by Basch and other co-authors reported an improvements in anxiety / negative affect and DM distress after virtual or clinic-based psych educational intervention, and provides preliminary evidence that intervention groups adapted for adolescents with T1DM are feasible to deliver and acceptable, with potential improvement in psychosocial, behavioral, and DM-specific outcomes (37). Wakelin et al study found that educational interventions significantly reduced parent and child psychological distress post-intervention and improved child blood glucose at short-term follow-up (38). The disparities among these studies can be attributed to differences in age demographics, assessment instruments (GAD-7 or other anxiety scales), nature and duration of intervention programs, follow-up duration, sample size, and the cultural or healthcare context influencing the original anxiety and responsiveness to treatment.

Association between the severity of anxiety level and studied variables socioeconomic status:

This study found that the rates of severe anxiety were significantly higher among children with low socio-economic state, multiple studies point to the role of socioeconomic factors in the prevalence rate of anxiety. A systematic review and meta-analysis conducted by Akbarizadeh et al, revealed that the incidence of anxiety had increased in lower-middle-income regions. This corresponds with the concept that low socioeconomic status, which may result in greater stress and limited access to resources, is a risk factor for mental health disorders, including anxiety in individuals with T1DM (39).

Psychological support or counselling: The current study also shows that children who didn't receive psychological support and counselling from their families had higher rates of sever anxiety, a similar study found that a dysfunctional family environment, marked by higher conflict and weakened cohesion, is substantially correlated with increased rates of anxiety and depression in adolescents with T1DM, the study reveals a negative correlation between family cohesion and anxiety (r=−0.360), suggesting that a drop in family cohesion is associated with an increase in anxiety levels (40)

Children who suffered from traumatic events: The current study reported that the rates of severe anxiety were significantly higher among children who suffered from traumatic events. Exposure to traumatic events, including those related to DM management, significantly increases the risk of developing anxiety in adolescents with T1DM. These findings underscore the importance of early identification and intervention to address mental health concerns in this vulnerable population (38).A study conducted by Lunkenheimer et, al revealed that over 14% of adolescents with T1DM also suffer from a comorbid mental disorder, such as a mood, behavior, or anxiety issue, It appears that having T1DM increases the likelihood of developing anxiety disorders, possibly as a consequence of the trauma and stress associated with managing it (41).

Duration of T1DM: This study showed a significant association between duration of T1DM and high level of severe anxiety, with higher levels appear at ≥ 5 years. This is in contrast to a study done by study by Reynolds et al., who revealed that children and adolescents with a prolonged period of T1DM demonstrated a lower anxiety levels compared to those with a recent diagnosis. This indicates that, over time, some children and families might develop more efficient coping mechanisms and routines (42).

Number of children: This study showed that severity of anxiety increased among families who had ≥ 4 children, this supports the idea that a larger family, potentially linked to diminished attention or increased conflict, might be a risk factor. (40)

Association between level of anxiety and studied variables of participant after the educational intervention program:

The present study revealed that there was a significant reduction in anxiety scores after interventions regarding all sociodemographic and clinical characteristics. Numerous recent studies confirm the significant decrease in anxiety scores among children with T1DM after educational interventions, regardless of demographic and clinical variables. A comprehensive review done by Luque et al, indicated that educational and psychological therapies significantly enhanced psychological outcomes in various pediatric groups

with T1DM (43). Riley et al study demonstrated that behavioral family systems therapy improved psychological well-being and metabolic outcomes irrespective of socioeconomic status, underscoring the widespread importance of these programs (44). A recent trial of educational program conducted by Gocen and colleagues demonstrated a significant decrease in anxiety scores in the intervention group relative to controls, thereby enhancing the beneficial effects of psych educational strategies on mental health in this demographic (45).

It had been reported that significant contributors to the onset of anxious symptoms among children and adolescents with T1DM include everyday stressors such as school and extra-curricular activities, which can negatively impact sleep quality. The additional responsibilities related to diabetes management, requiring time and attention, can limit participation in normal daily activities, contributing to anxiety. Emotional factors such as fear and worry, including the fear of hypoglycemia or fear of judgment when performing self-management tasks in public, are identified by participants as DM-specific anxieties (46).

Distribution of the studied sample according to level of depression before and after educational intervention program:

In this study, before the education intervention program and according to children's responses to the PHQ scale, about two thirds of the participants had moderate depression and, less than quarter of the participants had severe depression, after intervention program, half of the sample had mild depression, third of the participants had moderate level of depression and 11% had sever level, which shows a significant reduction in the mean PHQ score before and after educational interventions. A study conducted by Singh et al aimed to assess the feasibility of internet-based cognitive behavioral therapy on depressive symptoms in adolescents with T1DM. Results revealed that there was no significant difference between the participants selected for the intervention in regard to baseline PHQ. At the follow-up period, the participants who completed behavioral therapy showed a non-significant trend towards improvements in PHQ (47). Difference reported ahead might be attributed to the different baseline depression severity, more intensive and T1DM-tailored psycho educational delivery with different levels of engagement, cultural and sample differences, the post-intervention assessment timing, and the responsiveness among participants with multiple risk factors affect depression among those with T1DM

Association between level of depression and studied variables of the participants:

Socioeconomic status: In the present study, children with low SES had severe depression. Recent studies consistently revealed that lower socioeconomic level as a significant risk factor for depression in children and adolescents with T1DM, a study done by Al-Qahtani et, al showed a significant correlation between lower household income, and an increased incidence of depression. The psychological and financial burden of T1DM proper care is especially stressful for families with restricted resources, adversely impacting a child's mental health and their capacity to achieve optimal glycemic control (48).

Children with family history of mental disorders: The current study showed a positive association between presence of family history of mental illness and having depression among T1DM patients. A familial history of mental illness is a recognized as a risk factor for depression in the general population, and recent research verify that this is relevant to children with T1DM. Alassaf A et, al study revealed that a family history of depression is an acknowledged risk factor for suffering a depressive episode. Parental depression is a significant predictor of depressed symptoms in children with T1DM. The stress of managing a child's chronic illness might increase the likelihood of mental health disorders in parents, establishing a cyclical interaction, as parental depression adversely affects child's psychological health and treatment (49).

Lack of psychological support or counselling from their families: The lack of psychological support is a significant contributor to the onset of severe depression. Recent studies and professional recommendations emphasize the necessity of integrated, holistic care that attends to both the physical and mental health demands of children with T1DM. This had been improved in Resurrection et al study, as they claimed that a lack of psychological support can lead to negative behaviors, such as poor self-management, which, in turn, can worsen glycemic control and increase depressive symptoms (50).

Duration of T1DM: The present study showed that the lesser duration of the disease was, the lesser the severity of depression is. The duration of T1DM is often associated with an increased incidence of depression. This is probably attributable to the accumulated stress dealing with a chronic illness over a prolonged period. Adolescents with prolonged T1DM encounter greater daily care requirements and a greater likelihood of long-term consequences, both of which may result in psychological distress. Al-assaf and co-authors identified a significant association between prolonged diabetes duration (particularly beyond four years) and an increased prevalence of depression in diabetic adolescents (49).

Association between level of depression and studied variables of participant after the educational intervention program:

Although all investigated characteristics of participants are recognized as risk factors for depression in the general adolescent population, the influence of most of

these variables on depression scores in adolescents with T1DM, both before and after psycho educational interventions, remains not extensively investigated. Further investigation is required to determine whether they influence the beneficial effects of these interventions. Of these factors are:

Age of participants: Age may impact depression scores in adolescents with T1DM; however, the evidence is insufficient and does not definitively reveal that older age consistently correlates with greater depressive symptoms before to or after psychosocial therapies. Adolescents with T1DM (middle school) might show more clinically severe depressive symptoms compared to their older counterparts; however, age hasn't consistently been shown to be a reliable indicator of improvement in depression after responding to psycho educational interventions (51). Weissberg-Benchell et al performed a randomized trial in adolescents with T1DM in 2016, demonstrating the feasibility and beneficial effects of preventative and psycho educational programs. However, the study does not provide convincing evidence that age predicts variances in post-treatment depression reduction (52).

Gender: There is no consistent evidence that girls and boys differ in how significantly their depression scores change after psycho educational programs. This is regardless of the fact that female adolescents with T1DM tend to have higher baseline depressive symptoms. Randomized trials and systematic reviews of psycho educational interventions rarely test or find a reliable gender against treatment interaction (53),while Weissberg-Benchell et al found no consistent gender variation in treatment effect or inability to report formal gender against treatment interaction tests in their meta-analysis of large randomized clinical trials and psycho education trials. These trials failed to find benefits for specific psychosocial outcomes. Essentially, females exhibit greater depressed symptoms initially, but there is no consistent variation in their improvement compared to males after psycho educational programs. (52)

Number of children: Although family variables (such as support, conflict, and functioning) are important for both baseline symptoms and treatment outcomes, trials do not frequently examine family size as a moderator of depression scores in T1DM adolescents before or after psycho educational interventions. For example; most randomized clinical trials are failing to report moderator analyses for household size or number of children, but Cockcroft et al. highlights the impact of family environment, parental stress, and family support/conflict on emotional outcomes in adolescents (53).

Parent's age: Differently, parent age is rarely reported or tested as a moderator, but parental mental health, parenting practices, family functioning, and resilience are the family factors most consistently linked to adolescent depressive symptoms and intervention outcomes. Investigating the influence of family-based psycho education (PE) on adolescents with T1DM, Katz and colleagues conducted randomized controlled trials. Their results revealed insight into factors such as parental participation, parenting practices, parental distress, and resilience. However, they failed to investigate the impact of parental age as a predictor or as a treatment-age interaction (54).

Socioeconomic status: Few studies have formally examined the interactions between socioeconomic status and interventions, but it is known that adolescents from lower socioeconomic backgrounds who have T1DM are likely to have higher baseline depressive symptoms. PE interventions do improve depression overall, but socioeconomic status may influence both the severity of baseline symptoms and the magnitude of the response. Integrated care approaches that address both physical and mental health are crucial for improving outcomes in this population. Additionally, lower parental education and household income were found to be significantly associated with higher depressive symptoms in adolescents with T1DM even with PE intervention, according to Al- Qahtani et al study (48).

Duration of diabetes: While a prolonged period of T1DM could potentially affect mental well-being, currently available PE intervention studies in adolescents have not evaluated period as a contributing factor; further randomized clinical trials are needed to determine whether the duration of DM exposure affects modifications to depression symptoms. Grey and colleagues found that internet-based PE programs supported individuals dealing with depression and DM-related issues, but they simply looked at DM duration as a baseline characteristic and were not looking at the latter as a predictor of whether or not intervention would be effective (55).

Traumatic events: Adolescents with T1DM who have been with stressful events, such as trauma associated with diabetes, are more likely to have higher depression scores.

PE approaches can improve depressive symptoms; nevertheless, a history of trauma may affect the effectiveness of these interventions (42).

CONCLUSION

Two thirds of T1DM children showed severe levels of anxiety, who characterized by low SE level families, had four or more children in their families that lack of psychological support ,suffering from traumatic events in their life, and with prolonged duration of DM.

More than two thirds of T1DM children showed moderate levels of depression. Severe levels were noticed among those in low socioeconomic level

families, those with positive family history of mental disorders, lacking psychological support or counseling, and those with prolonged duration of DM.

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