

Factors Associated with Suicidal Ideation and Quality of Life in Adolescents from Puerto Rico with Type 1 Diabetes

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Objective: People with type 1 diabetes (T1D) may experience significant changes in their daily routines due to this condition, which frequently results in depressive symptoms and the deterioration of their quality of life. We examined the factors associated with suicidal ideation (SI) and diabetes-related quality of life (DRQOL) in adolescents (aged 12 to 17) with T1D.

Methods: The sample consisted of 51 youths (29 girls) recruited during a treatment study for depression. They completed the Diabetes Quality of Life for Youth questionnaire, the Suicidal Ideation Questionnaire-Junior, and other measures that explore emotional, cognitive, somatic, behavioral, and relational aspects. Their caregivers completed the Barriers to Adherence Questionnaire and the Somatic Complaints subscale of the Child Behavior Checklist, among other measures. We used correlation and multiple linear regression analyses to identify the factors associated with the dependent variables.

Results: The variables associated with SI were depression, somatic complaints, perceived family emotional support, self-care for diabetes, self-deprecation, helplessness, and hopelessness, among others. In a multiple regression analysis, the first 3 accounted for 46% of the variance. Those related to DRQOL included cognitive alterations, barriers to adherence, perceived family emotional support, self-efficacy for diabetes and for depression, helplessness, anxiety, and self-deprecation, among others. The first 4 accounted for 61% of the variance.

Conclusion: Our findings highlight the impact of emotional, cognitive, somatic, behavioral, and relational aspects on the quality of mental health and the DRQOL of youth with T1D, as well as their pertinence for the development of psychosocial interventions for this population. [*P R Health Sci J* 2018;37:19-25]

Key words: Diabetes, Adolescents, Quality of life, Suicidal ideation, Latinos/Hispanics

Type 1 diabetes (T1D) is an autoimmune disease characterized by the body's inability to produce insulin (1). By 2010, the odds of being diagnosed with diabetes among Puerto Ricans in the United States (US) were 94% higher than such odds were for non-Hispanic whites (2). In 2012, about 208,000 people under 20 years old (0.25%) in the US had diabetes (type 1 or type 2) (3). By then, the crude prevalence of diabetes among adults over 18 years of age in Puerto Rico was 16.4% (4). Puerto Rican children have one of the highest T1D incidences among minorities in US and the highest in Latin America (3, 5, 6).

Coping with T1D is an arduous process that requires adherence to a medical regimen that includes insulin administration, exercise, glucose monitoring, and following a meal plan to prevent further complications. Poor glycemic control (GC) may lead to microvascular complications such as neuropathy, retinopathy, and nephropathy (7, 8). Moreover, accepting T1D represents a challenge to most youths, considering the wish for independence characteristic of this

developmental phase. This desire is compromised because of the level of dependence on others that is associated with being a youth with a chronic disease. Resistance to accept their illness could also lead to rebellion towards figures of authority, such as doctors, which can have serious implications in terms of treatment adherence (9, 10).

The difficulties related to having a chronic illness are linked to the prevalence of suicidal behaviors among T1D youth. Research suggests that adolescents with T1D have a higher probability of presenting depressive symptoms and suicidal ideation (SI) (7, 11). Suicidal behavior comprises the wish to

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die as well as intrusive thoughts about death and possible ways to bring it about. It has been suggested that youths who have had diabetes for a long time, who are highly noncompliant in terms of their treatment, who have 1 or more coexisting psychiatric disorders, and who live in single-parent families, have a higher risk for SI (7, 12). Professionals must be alert to this problem, as it can be related to the improper use of insulin. Little research has been done on somatic complaints and suicidality in this population, although in a past study conducted with adolescents, somatic symptoms were found to predict suicide attempts (13).

In several studies youth with diabetes have presented higher levels of SI than expected, but their suicide attempt rates have been similar to those of the general population (7, 12, 14). In fact, in a study by Goldston et al. (7), although adolescents with diabetes had more suicidal thoughts, they were somewhat less prone to attempt suicide compared to the general community. Yet, in another study, the control group presented more suicidal ideation and attempts. Interestingly, in this study, T1D was also found to be a protective factor for suicidal behavior, at least for males (14).

According to the World Health Organization (WHO), quality of life (QOL) refers to the perception that a person has about his/her life, specific to a particular context and in relation to his/her expectations and worries (15). Adolescents with diabetes are vulnerable to having a poor health-related QOL (16). It is important to have a measure of QOL that is specifically aimed towards the perceptions that people with diabetes have about their condition, the impact it has on them, and the ways that they manage it (17). Such an instrument provides the tools for the promotion of treatment compliance and for the evaluation of the factors that affect their diabetes-related quality of life (DRQOL) (18). Those factors in adolescents may include the daily and strict tasks regarding self-care and the fear of health-related complications (10).

The presence of psychological symptoms such as depression and anxiety are related to poor QOL (19–22). Low self-esteem, low self-efficacy, and older age in adolescents have also been related to this construct (19). In contrast, it has been found that a high socioeconomic status (23, 24) and perceived family social support in diabetes management are associated with a good QOL (24). Although several studies have shown that GC is associated with this last variable (25–27), others have not found a significant relationship between them (11, 20, 28). Furthermore, it has been suggested that GC does not always accurately reflect an individual's QOL, as while a given individual's GC may be adequate, various stressors can affect his/her psychosocial state (29). These findings emphasize the importance of considering treatments aimed at targeting not only biological aspects but also psychosocial variables related to T1D youths' overall wellbeing (18).

The main objective of this study was to explore the factors related to SI and DRQOL in adolescents from Puerto Rico with T1D. We considered socio-demographics, family social support, depressive and anxiety symptoms, hopelessness,

self-care behaviors, barriers to T1D adherence, self-efficacy for diabetes and for depression, helplessness, self-deprecation, cognitive alterations, and anhedonia, as well as interpersonal and activity alterations, as possible correlates of these 2 variables. We also explored whether there was any relation between SI and DRQOL. Based on our reading of the research literature, we hypothesized that SI would be most highly associated with depressive symptoms. Regarding DRQOL, its association with self-care, social support, depression, and anxiety has been well documented, which made us expect similar findings.

Methods

Participants

This study was part of a major research project whose principal investigator was the second author of this manuscript. The data analyzed proceed from baseline assessments for that main study, which aimed to explore the initial efficacy of cognitive-behavioral treatment for depressed T1D youth. The participants were 51 Latino adolescents (29 girls) from ages 12 to 17 ($\bar{x} = 14.78$), accompanied by 1 caregiver each. Most of the participating adolescents (98.04%) were Puerto Rican, 56.86% lived in an urban zone, 43.14% lived in the San Juan metropolitan area, and 66.67% attended public schools. They ranged in grade from 6 through 12 ($\bar{x} = 9.51$, $SD = 1.70$). Their mean HbA1c value (based on their last private laboratory test prior to enrollment) was 9.14 (range: 5.76–17.70), with 73.5% of their values being over the limit of the current standards (30). The time elapsed since their T1D diagnosis ranged from less than 1 year to 15 years, with most (86.27%) of the adolescents having been diagnosed no less than 2 years prior to their enrollment. Their mean Children's Depression Inventory (CDI) score was of 19.53, suggesting that most presented moderate or severe depressive symptoms. The potential participant had to have obtained a score of 13 or greater on the CDI or a score of 44 or greater on the clinician-rated measure (see Measures) to be included in the main study. Psychotic symptoms, a history of bipolar disorder, recent (in the previous year) substance abuse/dependence, and imminent suicide risk were among the exclusion criteria. A more detailed description of the inclusion and exclusion criteria for the main study is presented elsewhere (31).

Most of the participants (72.55%) were from households with medium-low or low socioeconomic statuses. The mean household size was 4 members ($SD = .98$; range from 2 to 7). The primary caregivers were mostly (86.27%) women, mainly the biological mothers of the participants. About 45.10% of the youths lived with 2 parents/primary caregivers, while 29.41% and 13.73%, respectively, lived at homes in which the parents/caregivers were either divorced or separated. About 94.12% of the caregivers were Puerto Ricans. Their ages ranged from 32 to 58 years old ($\bar{x} = 43.45$, $SD = 6.59$). Around 52.94% had full-time employment, and 11.76% had part-time jobs.

Measures

Socio-Demographic Data Form

We collected data about each adolescent's biological sex, age, ethnicity, employment status, grade, and type (public, private, other) of school attended. The participants' primary caregivers provided much the same information (the first 4 items), as well as details regarding their specific job and their level of education; in addition, perceived socioeconomic status was determined.

Glycemic Control (GC)

Glycosylated hemoglobin levels (HbA1c) were obtained through the participants' laboratory results. In addition to acquiring each participant's most recent results from private laboratories, tests were conducted in laboratory facilities at the University of Puerto Rico Medical Sciences Campus.

Diabetes Quality of Life for Youth (DQOLY) questionnaire

This is a 51-item measure of DRQOL in youth. It includes 3 subscales: satisfaction with life, diabetes impact, and diabetes-related worries (32). With T1D youth from Puerto Rico, the internal reliability of its subscales ranged from .82 (impact) to .90 (satisfaction with life) (10). Higher DQOLY total scores are indicative of worse quality of life (more problems).

Suicidal Ideation Questionnaire-Junior (SIQ-Jr)

This is a 15-item self-report measure for the frequency of suicidal ideation in adolescents. It is rated using a 7-point (0 to 6) Likert-type format (33). In a sample of Puerto Rican youths, this scale had an internal consistency of .91 (34).

Beck Anxiety Inventory (BAI)

This measure of anxiety symptoms consists of 21 items (35). It has adequate validity and reliability with Puerto Rican (alpha = .89) T1D youths (9).

Children's Depression Rating Scale-Revised (CDRS-R)

It consists of 17 clinician-rated items which measure diverse areas of depressive symptomatology in children and adolescents (36). Its internal reliability with Puerto Rican youth is .82 (37).

Self-Care Inventory (SCI)

This is a valid and reliable self-report measure that explores self-care in adolescents with diabetes during the past month. When administered to Puerto Rican youths with T1D, a preliminary internal consistency (alpha) value of .79 was obtained (38).

Diabetes Social Support Questionnaire-Family Version (DSSQ-Family)

This instrument measures the frequency with which family members engage in supportive behaviors and adolescents' perceptions of family support as it relates to 5 aspects of diabetes: insulin use, blood tests, meal plan, exercise, and emotions (39). Its validity and reliability with respect to Puerto Rican youths with T1D has been documented (40).

Youth Helplessness and Hopelessness Scale (EIDA, by its Spanish acronym)

This 17-item measure contains 2 subscales from the Depressive Symptoms Spectrum Assessment Inventory (DSSAI), an indigenous depression scale validated with Puerto Rican youths. The internal consistency values for its subscales is .87 (helplessness) and .89 (hopelessness) (41).

Escala de Autoeficacia para la Depresión en Adolescentes (Self-Efficacy for Depression Scale – Youth; EADA, by its Spanish acronym)

This 28-item scale assesses the perceptions of adolescents with regard to their confidence in their ability to confront situations related to depression. Developed for the Puerto Rican population, it has a high internal consistency and excellent concurrent validity (42, 43).

Self-Efficacy for Diabetes scale (SED)

This is a 35-item scale designed to measure the self-perception or expectations of competence, power, and resources for the successful self-management of diabetes (44). Its internal reliability with Puerto Rican T1D youth is .91 (45).

Undervaluing/Self-reproach and Cognitive Alterations scale (IVARAC, by its Spanish acronym)

This measure also contains 2 subscales from the DSSAI. Its internal consistency is .89 for undervaluing/self-reproach (self-deprecation) and .88 for cognitive alterations (41).

Anhedonia, Interpersonal and Activity Alterations scale (ANEDINA, by its Spanish acronym)

This measure contains parent-rated versions of 3 DSSAI subscales. It was validated for use in the main research study. We used the Activity Alterations subscale, which has an internal consistency of .82 (46).

Barriers to Adherence Questionnaire (BAQ)

It assesses the frequency of both environmental and cognitive events that may be obstacles to regimen adherence (self-care) in people with diabetes (47). We used a parent-rated Spanish version of the BAQ, whose internal consistency in this sample (.80) was similar to that of the original version (values of .84 to .86).

Child Behavior Checklist (CBCL)

This is a measure that is completed by parents and that has been widely used in Puerto Rico. In this study we used the Somatic Complaints subscale, whose internal reliability for rating young women (.68) and young men (.74) is adequate (48).

Procedure

Information about the main study was disseminated in clinics for T1D, newspapers, and the radio and by distributing printed material at educational and recreational activities. Participants were recruited at summer camps and educational activities

and through service providers' referrals and referrals from school personnel and other participants. Caregivers had to complete a participation application, which was evaluated by the project's personnel. This was followed by an appointment with the caregivers and adolescents for an eligibility evaluation. Informed consents were provided by the caregivers and assent was obtained from the adolescents. Finally, the participants and their caregivers completed various instruments through interviews and self-reports. The participants in this study met the full inclusion criteria during the eligibility assessments of the main research project. This study was approved by the IRB offices of both UPR, Río Piedras (1112-005) and UPR, Medical Sciences Campus (A9530112).

Data analyses

We computed descriptive statistics for the sample description. Using the Pearson correlation coefficient (one-tailed; $p \leq .05$), we explored the relationship of potential correlates with SIQ-Jr and DQOLY total scores (the higher the score, the more severe the problems). To examine the ability of the independent variables to best explain the variance of youth SI or problems in DRQOL, we conducted multiple linear regression analyses ($p \leq .05$).

Results

The Pearson correlation between youth SI and DRQOL issues was .37 ($p \leq .01$). These were the dependent variables in the subsequent regression analyses. Variables associated with youth SI were depressive symptomatology, somatic complaints, perceived family emotional support, anxiety symptoms, diabetes self-care, undervaluing/self-reproach, helplessness, hopelessness, self-efficacy for depression, depression-related cognitive alterations, and barriers to diabetes-treatment adherence (Table 1). Except for somatic complaints, all these, as well as activity alterations and self-efficacy for diabetes, were significantly associated with DRQOL scores, as reported by the participating adolescents. SI did not correlate with the socio-demographic variables evaluated, whereas a significant association was found between QOL and the adolescents' ages ($r = .25$; $p \leq .05$). The QOL scores did not correlate with HbA1c values measured as a continuous variable, but were significantly associated with obtaining HbA1c values greater than or equal to 7.50 ($r = .32$; $p \leq .05$). All the correlations that were significant went in the expected direction. The magnitude of the significant correlation coefficients for the variables in Table 1 ranged from .23 to .61 for SI and from .28 to .61 for QOL.

In a multiple regression analysis to explain SI, depressive symptoms, somatic complaints, and perceived family emotional support were the best and only independent predictors, explaining 46% of the variance (Table 2). Depression was the variable with the highest contribution, followed by somatic complaints. To avoid the inflation of the correlation between depressive symptoms and SI, the CDRS-R scores didn't include

Table 1. Association of variables of interest with suicidal ideation and quality of life

Variables	SIQ-JR Total Score	DQOLY Total Score
Youth anxiety symptoms	.28*	.43***
Youth depressive symptoms	.61***	.28*
Perceived family emotional support (feelings)	-.23*	-.32**
Helplessness	.34**	.49***
Hopelessness	.34**	.43***
Self-efficacy for depression	-.33**	-.57***
Diabetes self-care behaviors	-.36**	-.36**
Self-efficacy for diabetes	-.14	-.43***
Somatic complaints	.33**	.12
Activity alterations	.17	.39**
Undervaluing/Self-reproach	.36**	.61***
Cognitive alterations	.28*	.58***
Barriers to adherence	.23*	.46***
Inadequate glycemic control (HbA1c ≥ 7.50)	.16	.32**

Note: SIQ-Jr = Suicidal Ideation Questionnaire-Junior; DQOLY = Diabetes Quality of Life for Youth; HbA1c = Glycosylated hemoglobin; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$ (one-tailed).

items about death or suicidal ideas. The best regression model to explain QOL scores reported by the youths in our sample accounted for 61% of the variance (Table 3). This model included independent contributions of variance from cognitive alterations, barriers to adherence, perceived family emotional support, and self-efficacy for diabetes scores. The scores from the Cognitive Alterations subscale were the ones with the most influence (β) on variance.

Table 2. Hierarchical multiple regression to explain suicidal ideation associated with T1D

Variables	B	SE	β	R ² Change	R ² Total
<i>First step</i>					
Depressive symptoms	.98***	.26	.48***	--	.232
<i>Second step</i>					
Depressive symptoms	1.00***	.24	.49***	.117	--
Somatic complaints	2.02**	.69	.34**	--	.349
<i>Final step</i>					
Depressive symptoms	1.03***	.22	.51***		
Somatic complaints	2.51***	.65	.42***	.112	--
Perceived family emotional support	-1.13**	.36	-.35**	--	.461

Note: T1D = Type 1 diabetes; B = Regression Coefficient; SE = Standard Error; β = Standardized Regression Coefficient; R² = Variance explained; F (3, 47) = 13.47, $p \leq .001$; Adjusted R² = .43; ** $p \leq .01$; *** $p \leq .001$.

Discussion

In this study, we explored the factors associated with SI and DRQOL in T1D youth. Perceptions of poorer QOL and higher frequency of suicidal thoughts were significantly related. Specifically, adolescents' worries about diabetes and the impact the illness has on them can diminish their satisfaction with life and increase the frequency of morbid and suicidal thoughts. In addition, experiencing SI can exacerbate adolescents' difficulties with T1D self-care, leading not only to poorer health but also to

Table 3. Hierarchical multiple regression to explain quality of life problems associated with T1D

Variables	B	SE	β	R ² Change	R ² Total
First step					
Cognitive alterations	2.41***	.48	.58***	--	.335
Second step					
Cognitive alterations	2.06***	.46	.50***	.105	--
Barriers to adherence	.41**	.14	.33**		.440
Third step					
Cognitive alterations	2.00***	.44	.48***		
Barriers to adherence	.39**	.13	.32**	.075	--
Perceived family emotional support	-1.41**	.53	-.27**		.515
Final step					
Cognitive alterations	1.80***	.40	.43***		
Barriers to adherence	.38**	.12	.31***	.097	--
Perceived family emotional support	-1.32**	.48	-.26***		--
Self-efficacy for diabetes	-.35***	.10	-.32***		.612

Note: T1D = Type 1 diabetes; B = Regression coefficient; SE = Standard error; β = Standardized regression coefficient; R² = Variance explained; F(4, 46) = 18.17, p < .001; Adjusted R² = .58; **p < .01; ***p < .001.

more intense diabetes-related worries, thereby having a negative impact on their lives.

As suggested by our findings, suicidal thoughts in T1D youth are related to high anxiety and depressive symptoms and to negative views about themselves, the future, and their ability to cope with depression, as well as to poorer self-care behaviors. However, while some studies have found an association between socio-demographic factors and suicidality, none was found in this study. Results from the multiple regression analysis did, however, support the scientific literature, as they emphasize the predominant role of depressive symptoms as a predictor of suicidality. The fact that, in this sample, somatic complaints and perceived family emotional support contributed additional independent variance on SI shows that somatic and interpersonal factors aggravate this type of symptom in T1D youth. More research on this topic is needed, as the link between somatic complaints and SI has not been well studied in this population. On the other hand, the role of family emotional support is fundamental in the management of T1D due to the emotional baggage involved for adolescents. In depressed T1D youth, a poor perception of diabetes-specific family support could be particularly related to the negative view of others and the world that has been frequently found in patients with depression.

QOL in T1D youth was significantly related to many mental health (e.g., anxiety and depressive symptoms, hopelessness, helplessness, undervaluing/self-reproach, activity alterations, self-efficacy for depression) and diabetes-related factors (e.g., self-care, barriers to adherence, self-efficacy for diabetes). However, as reflected in the multiple regression analysis, the cognitive alterations scores were superior to other possible predictors in explaining unique variance for QOL. This particular finding may be related to some of the individual components of

this scale, which included items on rumination, mental fatigue, and difficulty in accepting changes and remembering things. Moreover, these specific cognitive problems may affect diabetes self-care and self-efficacy, resulting in further deterioration in youth QOL.

It is worth noting that perceived family emotional support was the only variable to contribute independently to the variance of both SI and QOL, highlighting its importance as a target in interventions for youth and their families. Such interventions should include not only promoting family behaviors intended to help their children but also working with teenagers to improve their recognition of family efforts to support them. Finally, as occurred in some other studies (11, 20, 28), we found no significant linear association between QOL and HbA1c continuous scores. However, HbA1c values of at least 7.50 and a higher age did correlate with poorer reports of QOL, which is similar to the findings of some other studies.

Because of its small sample size, the statistical power of our study is limited. Nevertheless, our findings stress the importance of emotional, cognitive, behavioral, somatic, and relational aspects in the quality of mental health and QOL of T1D youth in Puerto Rico. Health care providers should be aware of these factors, as they may influence this condition, considering the vast emotional strain it places on the youths who suffer from it. This study stresses the need for professionals and caregivers to be aware of the possibility of SI in adolescents with T1D and the consequences that its presence may bring to their treatment adherence and general well-being. Knowledge about the examined factors should also enhance communications between providers, caregivers, and adolescents as a means to improve the educational process about T1D management and its emotional impact. This study provides useful information for the development of psychosocial interventions aimed at the particular needs of this population, especially by suggesting that somatic and interpersonal aspects (not only cognitive, behavioral, and emotional ones) are important areas to consider when designing such interventions. Health professionals and relatives of T1D adolescents should keep in mind the fact that diabetes influences not only the physical but also the psychological health status of those individuals who have it and that the disease pervasively affects their sense of meaning and satisfaction with life. Further research is needed to assess the efficacy of the available psychosocial interventions in reducing SI and improving DRQOL in this population. We hope that findings from this study may inform about possible adjustments that health professional could make to those interventions to better serve the needs of adolescents with T1D and their families.

Resumen

Objetivo: Las personas con diabetes tipo 1 (DT1) pueden experimentar cambios significativos en su rutina diaria debido a la condición, la que frecuentemente resulta en síntomas

depresivos y deterioro de la calidad de vida. Examinamos los factores asociados a la ideación suicida (IS) y la calidad de vida relacionada a la diabetes (CVRD) en adolescentes con DT1. Método: Participaron 51 jóvenes (29 muchachas) de 12 a 17 años reclutados(as) durante un estudio de tratamiento para la depresión. Completaron el Diabetes Quality of Life for Youth, el Suicidal Ideation Questionnaire-Junior y otras medidas sobre aspectos emocionales, cognitivos, somáticos, conductuales y relacionales. Sus encargados completaron el Barriers to Adherence Questionnaire y la subescala de Quejas Somáticas del Child Behavior Checklist, entre otras. Realizamos análisis de correlación y regresión lineal múltiple para identificar factores asociados a las variables dependientes. Resultados: Las variables asociadas a la IS fueron depresión, quejas somáticas, apoyo emocional familiar percibido, infravaloración/autorreproche, autocuidado e indefensión, entre otras. En una regresión múltiple para explicar la IS, las primeras 3 explicaron 46% de la varianza. Las vinculadas a la CVRD fueron alteraciones cognitivas, barreras a la adherencia, apoyo emocional familiar percibido, autoeficacia para la diabetes y la depresión, desesperanza, indefensión, ansiedad e infravaloración/autorreproche, entre otras. Las primeras 4 explicaron 61% de la varianza. Conclusión: Nuestros hallazgos resaltan el impacto de los aspectos emocionales, cognitivos, somáticos, conductuales y relacionales en la salud mental y la CVRD en adolescentes con DT1, así como su pertinencia al desarrollar intervenciones psicosociales dirigidas a esta población.

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References

1. American Diabetes Association. (2) Classification and diagnosis of diabetes. *Diabetes Care* 2015;38:Suppl:S8–S16.

2. Centers for Disease Control and Prevention. National Diabetes Fact Sheet: National estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2011.
3. Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2014: Estimates of diabetes and its burden in the United States. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention; 2014.
4. Puerto Rico Department of Health. Informe de Enfermedades Crónicas, Puerto Rico, 2012. [Report on Chronic Diseases, Puerto Rico, 2012] San Juan, PR; 2014.
5. Frazer de Llado TE, Gonzalez de Pijem L, Hawk B. Incidence of IDDM in children living in Puerto Rico. Puerto Rican IDDM Coalition. *Diabetes Care* 1998;21:744–746.
6. Karvonen M, Viik-Kajander M, Moltchanova E, Libman I, LaPorte R, Tuomilehto J. Incidence of childhood type 1 diabetes worldwide. Diabetes Mondiale (DiaMond) Project Group. *Diabetes Care* 2000;23:1516–1526.
7. Goldston DB, Kelley AE, Reboussin DM, Daniel SS, Smith JA, Schwartz RP, et al. Suicidal ideation and behavior and noncompliance with the medical regimen among diabetic adolescents. *J Am Acad Child Adolesc Psychiatry* 1997;36:1528–1536.
8. Zimmerman R. Microvascular Complications of Diabetes. August 2010; Available at: <http://www.clevelandclinicmeded.com/medicalpubs/disease-management/endocrinology/>. Accessed January 15, 2016.
9. Rosselló J, Jiménez-Chafey MI. Depressive and anxious symptomatology in Puerto Rican Youth with type 1 diabetes mellitus and their relationship to glycemic control. *Cienc Conducta* 2007;22:103–126.
10. Jiménez-Chafey MI, Rosselló J. Calidad de vida en adolescentes puertorriqueños/as con diabetes tipo 1 [Quality of life in Puerto Rican adolescents with type 1 diabetes]. *Rev Puertorriquena Psicol* 2005;16:51–70.
11. Grey M, Davidson M, Boland E, Tamborlane W. Clinical and psychosocial factors associated with achievement of treatment goals in adolescents with diabetes mellitus. *J Adolesc Health* 2001;28:377–385.
12. Kakleas K, Kandyla B, Karayianni C, Karavanaki K. Psychosocial problems in adolescents with type 1 diabetes mellitus. *Diabetes Metab* 2009;35:339–350.
13. Borowsky IW, Ireland M, Resnick MD. Adolescent suicide attempts: risks and protectors. *Pediatrics* 2001;107:485–493.
14. Radobuljac MD, Bratina NU, Battelino T, Tomori M. Lifetime prevalence of suicidal and self-injurious behaviors in a representative cohort of Slovenian adolescents with type 1 diabetes. *Pediatr Diabetes* 2009;10:424–431.
15. The WHOQOL Group. The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization. *Soc Sci Med* 1995;41:1403–1409.
16. Cheung R, Young Cureton V, Canham DL. Quality of life in adolescents with type 1 diabetes who participate in diabetes camp. *J Sch Nurs* 2006;22:53–58.
17. The DCCT Research Group. Reliability and validity of a diabetes quality-of-life measure for the diabetes control and complications trial (DCCT). *Diabetes Care* 1988;11:725–732.
18. Novato Tde S, Grossi SAA. Factors associated to the quality of life of adolescents with type 1 diabetes mellitus [in Portuguese]. *Rev Esc Enferm USP* 2011;45:770–776.
19. Abolfotouh MA, Kamal MM, El-Bourgy MD, Mohamed SG. Quality of life and glycemic control in adolescents with type 1 diabetes and the impact of an education intervention. *Int J Gen Med* 2011;4:141–152.
20. Grey M, Boland EA, Yu C, Sullivan-Bolyai S, Tamborlane WV. Personal and family factors associated with quality of life in adolescents with diabetes. *Diabetes Care* 1998;21:909–914.
21. Law GU, Kelly TP, Huey D, Summerbell C. Self-management and well-being in adolescents with diabetes mellitus: do illness representations play a regulatory role? *J Adolesc Health* 2002;31:381–385.
22. Skinner TC, Hampson SE. Personal models of diabetes in relation to self-care, well-being, and glycemic control. A prospective study in adolescence. *Diabetes Care* 2001;24:828–833.

23. Hassan K, Loar R, Anderson BJ, Heptulla RA. The role of socioeconomic status, depression, quality of life, and glycemic control in type 1 diabetes mellitus. *J Pediatr* 2006;149:526–531.
24. Pereira MG, Berg-Cross L, Almeida P, Machado JC. Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes. *Int J Behav Med* 2008;15:187–193.
25. Vanelli M, Chiarelli F, Chiari G, Tumini S. Relationship between metabolic control and quality of life in adolescents with type 1 diabetes. Report from two Italian centres for the management of diabetes in childhood. *Acta Biomed* 2003;74:13–17.
26. Frøisland DH, Graue M, Markestad T, Skrivarhaug T, Wentzel-Larsen T, Dahl-Jørgensen K. Health-related quality of life among Norwegian children and adolescents with type 1 diabetes on intensive insulin treatment: a population-based study. *Acta Paediatr* 2013;102:889–895.
27. Mortensen HB, Hvidore Study Group on Childhood Diabetes. Findings from the Hvidore Study Group on Childhood Diabetes: metabolic control and quality of life. *Horm Res* 2002;57 Suppl 1:117–120.
28. Graue M, Wentzel-Larsen T, Hanestad BR, Båtsvik B, Sovik O. Measuring self-reported, health-related, quality of life in adolescents with type 1 diabetes using both generic and disease-specific instruments. *Acta Paediatr* 2003;92:1190–1196.
29. O'Neil KJ, Jonnalagadda SS, Hopkins BL, Kicklighter JR. Quality of life and diabetes knowledge of young persons with type 1 diabetes: Influence of treatment modalities and demographics. *J Am Diet Assoc* 2005;105:85–91.
30. American Diabetes Association. Standards of medical care in diabetes-2016. *Diabetes Care* 2016;39:S1–S112.
31. Cumba-Avilés E, Sáez-Santiago E. Research program on type 1 diabetes and youth depression in Puerto Rico. *Rev Puertorriquena Psicol* 2016;27:44–60.
32. Ingersoll GM, Marrero DG. A modified quality-of-life measure for youths: Psychometric properties. *Diabetes Educ* 1991;17:114–120.
33. Reynolds WM. Suicidal Ideation Questionnaire. Professional Manual. Odessa, FL: Psychological Assessment Resources, Inc.; 1988.
34. Duarté Y. Un modelo socio-cognitivo de vulnerabilidad a la ideación suicida en una muestra de adolescentes puertorriqueños/as [A socio-cognitive vulnerability model of suicide ideation in a sample of Puerto Rican adolescents]. Unpublished dissertation, 2007.
35. Beck AT, Steer RA. The Beck Anxiety Inventory. San Antonio, TX: Psychological Corporation; 1993.
36. Poznanski EO, Mokros HB. Children Depression Rating Scale-Revised (CDRS-R), Manual. Torrance, CA: Western Psychological Services; 1996.
37. Cumba-Avilés E, Bernal G, Rodríguez-Quintana N. Reliability and validity of the Children's Depression Rating Scale-Revised (CDRS-R) in a sample of Puerto Rican depressed adolescents. Unpublished report; 2017.
38. Adorno-Rodríguez K, Torres-Aponte L, Ramos-González N, Cumba-Avilés E. Confiabilidad del Self-Care Inventory y niveles de autocuidado en adolescentes con diabetes tipo 1 [Reliability of the Self-Care Inventory and levels of self-care in adolescents with type 1 diabetes]. Second Undergraduate Encounter of Research and Creation; San Juan, PR; April 2014.
39. La Greca AM, Bearman KJ. The Diabetes Social Support Questionnaire-Family version: Evaluating adolescents' diabetes-specific support from family members. *J Pediatr Psychol* 2002;27:665–676.
40. Piñero-Meléndez M, Fernández-Nieves M, Quiles-Jiménez M, et al. Propiedades psicométricas del Diabetes Social Support Questionnaire-Family (DSSQ-F) en adolescentes de Puerto Rico con diabetes tipo 1. *Abstract. P R Health Sci J* 2015;34:77–78.
41. Feliciano López V, Cumba-Avilés E. Propiedades psicométricas del Inventario para la Evaluación del Espectro de la Sintomatología Depresiva en adolescentes [Psychometric properties of the Depressive Symptoms Spectrum Assessment Inventory in youth]. *Rev Puertorriquena Psicol* 2014;25:260–278.
42. Díaz-Santos M, Cumba-Avilés E, Bernal G, Rivera-Medina C. Factor Structure of the Escala de Autoeficacia para la Depresión en Adolescentes (EADA). *Hispanic J Behav Sci* 2011;33:447–468.
43. Díaz Santos M, Cumba-Avilés E, Bernal G, Rivera Medina C. Desarrollo y propiedades psicométricas de la Escala de Autoeficacia para la Depresión en Adolescentes (EADA) [Development and psychometric properties of the Escala de Autoeficacia para la Depresión en Adolescentes]. *Interam J Psychol* 2008;42:218–227.
44. Grossman HY, Brink S, Hauser ST. Self-efficacy in adolescent girls and boys with insulin-dependent diabetes mellitus. *Diabetes Care* 1987;10:324–329.
45. Rosselló J, Jiménez-Chafey MI. Cognitive-behavioral group therapy for depression in adolescents with diabetes: a pilot study. *Interam J Psychol* 2006;40:219–226.
46. Piñero-Meléndez M, Estrada-Rodríguez, V, Cumba-Avilés E. Alteraciones de la actividad en adolescentes con diabetes y depresión juvenil: Confiabilidad, validez y sensibilidad al cambio [Activity alterations in adolescents with diabetes and depression: Reliability, validity and sensitivity to change]. In: Fernández-Nieves M, coordinator. *Evaluando la Depresión en Jóvenes con Diabetes Tipo 1 desde la Perspectiva Parental*. Symposium presented at the 6th Student Research Conference of Psychology, Río Piedras, PR; 2015.
47. Glasgow R, McCaul K, Schafer L. Barriers to regimen adherence among persons with insulin-dependent diabetes. *J Behav Med* 1986;9:65–77.
48. Rubio-Stipec M, Bird H, Canino G, Gould M. The internal consistency and concurrent validity of a Spanish translation of the Child Behavior Checklist. *J Abnorm Child Psychol* 1990;18:393–406.