Depressive Symptoms and Quality of Life in Adolescents With Type 2 Diabetes

Baseline data from the TODAY study

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OBJECTIVE—The study objective was to examine the prevalence of depressive symptoms and relationships to quality of life and demographics in the Treatment Options for Type 2 Diabetes in Adolescents and Youth (TODAY) study's large, ethnically diverse youth with type 2 diabetes.

RESEARCH DESIGN AND METHODS—A total of 704 youth with type 2 diabetes <2 years' duration, aged 10–17 years, and BMI ≥85th percentile completed depressive symptoms and quality of life measures.

RESULTS—Some 14.8% reported clinically significant depressive symptoms, and older girls had significantly higher rates than older boys.

CONCLUSIONS—Rates of significant depressive symptoms were similar to those of healthy adolescents and lower than those of teens with type 1 diabetes. Elevated depressive symptoms, particularly in older girls, suggest clinicians assess vulnerability.

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L ittle is known about physiologic and psychosocial correlates of type 2 diabetes in adolescents, whereas data on adults with type 2 diabetes are available, with rates of depressive symptoms approximately twice as high as for adults without diabetes (1), underscoring the importance of examining depressive symptoms in adolescents with type 2 diabetes. Depression in adults is also associated with significant psychosocial and physical complications (2). To date, we have not had access to large samples of patients needed to study depression systematically in youth with type 2 diabetes. Treatment Options for Type 2 Diabetes in Adolescents and Youth (TODAY) offers unique data concerning the psychosocial functioning of youth with type 2 diabetes.

RESEARCH DESIGN AND METHODS

Participants
The TODAY study design and participant characteristics have been reported (3). The protocol was approved by an External Evaluation Committee convened by the National Institute of Diabetes and Digestive and Kidney Diseases and by institutional review boards of each participating institution. Participants provided informed consent or assent.

Procedures
Eligible youth and an adult caregiver were recruited at 15 TODAY clinical centers (Supplementary Data). Relevant to the current report, youth were ineligible if diagnosed with major depression or if taking psychotropic medications. Before baseline, youth successfully completed a run-in phase lasting 8–24 weeks, during which youth had to establish blood glucose HbA_{1c} <8% on metformin alone. Of the 927 youth who entered run-in, 704 (76%) successfully completed run-in and provided baseline data; 55 youth (5.9%) were not able to maintain glycemic control on metformin alone. Average HbA_{1c} at baseline was 5.9% (5.5–6.5). Detailed clinical characteristics of the TODAY cohort at baseline have been reported (3).

Depressive symptoms. The Children's Depression Inventory (CDI) (4), assessing depressive symptoms, was completed by participants aged ≤15 years. Items are combined into a total depressive symptom score. A cutoff score ≥13 identifies clinically significant levels of depressive symptoms (4).

The Beck Depression Inventory II (BDI-II) (5) was completed by participants aged ≥16 years. Items are combined into a total score, with a cutoff score ≥14 to identify a clinically significant level of depressive symptoms. Scores ≥29 are suggestive of "severe" depressive symptoms.

Quality of life. Pediatric Quality of Life (PedsQL) (6) measures the youth's perception of quality of life. The 23 items are scored using a five-point Likert scale; a total score is the average of all items.

Statistical methods

Descriptive statistics at randomization are reported as means, SDs, or percents above cutoffs for serious level of depressive symptoms. Analysis of variance or t tests were used to compare mean depressive symptoms and χ^2 tests for percent above predefined cut points, by sex and race/ethnic group. Pearson correlation coefficients were used to compare the relationship between depressive symptoms and quality of life.

RESULTS—The demographic characteristics of the 704 youth randomized in TODAY have been reported (3). Briefly, girls comprised 65% of the sample, and 61% were aged 12–15 years. More than 80% reported minority race/ethnicity. Participants were overweight or obese, with 87% having a BMI >95th percentile for age and sex. Socioeconomic status was low, with >25% from homes in which neither parent had a high school diploma.

As shown in Table 1, 14.8% of youth reported depressive symptoms above the threshold for clinical significance. No differences in depressive symptom scores were seen across race/ethnicity; however, there were differences by sex (Table 1). BDI was significantly higher in older girls than in older boys, as was the percent scoring at or above the cutoff score for BDI and for CDI and BDI combined. No differences were found in the PedsQL or CDI for either race/ethnicity or sex. Both CDI and BDI were negatively correlated with PedsQL, −0.59 for the CDI and −0.63 for the BDI (both $P < 0.001$).

CONCLUSIONS—In the TODAY cohort, ~15% scored at or above the cutoff for clinically significant depressive symptoms, a rate similar to that of adolescents without type 2 diabetes (7). Depressive symptoms were not assessed before run-in. Thus, although it is not possible to rule out that completion of run-in had some psychologic benefits for participants, with respect to demographic and depressive symptom characteristics, the TODAY cohort at baseline was similar to youth with type 2 diabetes in the population-based SEARCH for Diabetes in Youth Study (SEARCH) (8,9).

Older female adolescents reported more depressive symptoms in comparison with younger girls and with boys. A post hoc analysis revealed that only a small number of older youth ($n = 11$, all girls; 1.6%) scored at or above the usual cutoff score (≥ 29) for "severe" depressive symptoms. This pattern is similar to that of population samples where rates of depression are approximately the same for boys and girls during childhood, but diverge during adolescence when girls have depression rates two to three times higher than boys (10). Current results also are similar to those reported in the SEARCH study, which found that being female and older were risk factors for higher rates of depressive symptoms (11).

Depression is the most studied psychosocial factor in adolescents with type 1 diabetes, with prevalence rates for increased risk of elevated depressive symptoms reported between 14 and 33% (12,13). The risk for depression increases as adolescents with type 1 diabetes develop into young adulthood, with Kovacs et al. (14) reporting that half of young adults with type 1 diabetes followed since adolescence developed a depressive or anxiety disorder.

There were no significant differences in depressive symptom or quality of life scores across racial/ethnic groups in either age-group. As expected, lower quality of life scores were significantly related to higher rates of depressive symptoms in both age-groups.

Because of the study design, at baseline the TODAY sample was relatively homogeneous, which may limit generalizability. Youth had low socioeconomic status and were predominately minorities, overweight/obese, and in adequate glycemic control at baseline. As the TODAY cohort becomes more heterogeneous over time with respect to glycemic control, BMI, and adherence, baseline depressive symptoms may become important predictors of subsequent treatment outcomes.

Although sample homogeneity is regarded as a study limitation, it is important to note that despite adequate glycemic control at baseline a large percentage of participants also had serious metabolic abnormalities present (3). Moreover, the sex, age, racial/ethnic groups, socioeconomic level, and depressive symptom characteristics of the TODAY cohort are similar to the those of the population-based SEARCH study (8,9), which suggests that the TODAY cohort is representative of the population of youth with type 2 diabetes in the U.S.

Table 1—*Mean (SD) scores on the PedsQL, CDI (youth aged ≤ 15 years), and BDI (youth aged ≥ 16 years), and percent scoring at or above the cutoff score for "serious level of depressive symptoms" on each inventory and for combined CDI and BDI by racial/ethnic group and by sex*

	PedsQL (all ages)		CDI (aged 10–15 years)			BDI (aged ≥16 years)			CDI ≥13 or BDI ≥14 (%)
	N	Mean (SD)	N	Mean (SD)	≥13 (%)	N	Mean (SD)	≥14 (%)	
Total	689	80.02 (12.04)	513	7.08 (6.36)	14.8	174	6.36 (7.55)	14.9	14.8
Race/ethnicity									
American Indian	42	78.23 (13.17)	28	6.50 (7.62)	14.3	15	7.87 (7.11)	13.3	14.0
Black non-Hispanic	217	79.58 (12.35)	166	7.02 (5.79)	15.1	50	6.02 (7.21)	14.0	14.8
Hispanic	282	80.54 (11.33)	213	7.38 (6.13)	15.0	68	7.40 (8.69)	20.6	16.4
White non-Hispanic	137	80.09 (12.44)	97	6.68 (7.41)	14.4	38	4.21 (5.29)	5.3	11.9
Asian non-Hispanic	11	81.25 (15.08)	9	7.22 (6.22)	11.1	3	8.00 (10.44)	33.3	16.7
P value*		0.63		0.77	0.99		0.17	0.20	0.68
Sex									
Female	450	79.49 (12.13)	351	7.19 (6.65)	15.1	101	8.27 (8.79)	22.8	16.8
Male	239	81.01 (11.83)	162	6.85 (5.68)	14.2	73	3.71 (4.18)	4.1	11.1
P value		0.11		0.58	0.79		<0.001	<0.001	0.044

*P values across racial/ethnic groups were computed without Asian non-Hispanic because of the small sample size.

Type 2 diabetes doubles the risk of depression in adults, with less than 25% receiving adequate depression treatment (15). Given the serious negative physical and psychosocial complications in depressed adults with type 2 diabetes (2,15), clinicians caring for older youth with type 2 diabetes should be familiar with mental health resources. Given the trajectory documented in adolescents with type 1 diabetes and high depressive symptoms for these symptoms to worsen as the older teen transitions into young adulthood, it is imperative to monitor and refer older adolescents with type 2 diabetes and depressive symptoms.

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