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Original article

Depressive Symptoms at Critical Times in Youth With Type 1 Diabetes: Following Type 1 Diabetes Diagnosis and Insulin Pump Initiation

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A B S T R A C T

Purpose: Depressive symptoms occur at various times during the life cycle in persons with type 1 diabetes. We investigated depressive symptoms prospectively in youth with new-onset type 1 diabetes and in those beginning pump therapy.
Methods: Youth with type 1 diabetes (N = 96), ages 10–17 years, completed the Children's Depression Inventory (CDI) at baseline and at 1, 6, and 12 months after diabetes onset or pump start; scores ≥13 indicated clinical elevation. The change in depressive symptoms and the association between CDI score and hemoglobin A1c (HbA1c) level were assessed over 1 year.
Results: The new-onset group (n = 54) had an HbA1c level of 11.4% ± 2.5%. The pump group (n = 42) had a diabetes duration of 4.1 ± 3.4 years and an HbA1c level of 8.3% ± 1.3%. The baseline median CDI was 5.0 in both groups and remained low over time (ranging from 2.0 to 3.5). Most youth (new onset 72%, pump 81%) scored <13 at all times. Those with a CDI score of ≥13 in month 1 had 9-fold (95% confidence interval: 3–28) and 11-fold (95% confidence interval: 3–38) higher risks of CDI score of ≥13 at 6 and 12 months, respectively, than those with a CDI score of <13. New-onset youth with a CDI score of ≥13 in month 1 had a higher HbA1c level at 6 months (8.3% ± 1.7%) than new-onset youth with a CDI score of <13 (7.2% ± 1.6%, $p = .04$).
Conclusions: CDI scores over 1 year were similar in the new-onset and pump groups. Youth with elevated CDI in the first month after diagnosis or pump start were significantly more likely to have a CDI score of ≥13 at 6 or 12 months, supporting recommendations to screen for depressive symptoms because of persistence over time. Those with new-onset diabetes and depressive symptoms in the first month had higher HbA1c at 6 months; confirmatory research is needed.

IMPLICATIONS AND CONTRIBUTIONS

Depressive symptoms were similar over 1 year in youth with type 1 diabetes at two important transition points: diagnosis and beginning insulin pump therapy. Youth with depressive symptoms in month 1 were more likely to experience depressive symptoms at 6 and 12 months, highlighting the importance of depressive symptom screening.

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Depressive symptoms are common in the general adolescent population and are even more common in adolescents with chronic disease, especially those with conditions as demanding as type 1 diabetes [1,2]. Reports of the estimated prevalence of depression in adolescents vary from 3% to 8% [3] to up to 20% [4–6], highlighting the importance of examining depression in teens. Studies indicate that 15%–23% of youth with type 1 diabetes meet the cutoff for clinically elevated depressive symptoms; further, depression disproportionately affects those with lower family income, obesity, older age, and longer duration of diabetes (>10 years) [2,7–12]. The management of type 1 diabetes demands substantial efforts from patients and families, beginning with diagnosis and continuing through transitions to various treatment modalities. Youth with type 1 diabetes exert significant energy each day checking blood glucose levels, administering insulin, and monitoring diet and exercise, in efforts to achieve target glycemic control. The complex relationship between depression and diabetes is likely bidirectional. Depression can negatively impact diabetes self-care and lead to decreased management adherence, poorer glycemic control, diminished quality of life, and increased need for hospitalization [12,13]. Depression and uncontrolled diabetes may both be associated with metabolic derangements and increased systemic inflammation related to insulin resistance, leading to deteriorating glycemic control and poor outcomes [14,15].

In contrast to survey assessment, the gold standard for diagnosing depression is a diagnostic interview based on established criteria. Self-report questionnaires are often used in both clinical and research settings to identify depressive symptoms in an efficient and sensitive way; however, these screening tools are not specific, and depressive symptoms detected on self-report surveys should be followed up with clinical interview. Some constructs may overlap with depressive symptoms. In established diabetes, the rigors of self-care can lead to diabetes distress, which is distinct from but often related to depressive symptoms. Most surveys measuring depressive symptoms have been validated in otherwise healthy populations; in patients with diabetes, there may be an overlap in depressive symptoms and diabetes distress [16,17]. In new-onset diabetes, it is common for youth to experience adjustment reactions related to coping with the initial stress of the diagnosis of a chronic disease, and the symptoms of adjustment reactions, including mild sadness, anxiety, loneliness, and social withdrawal, may overlap with depressive symptoms [18].

Studies have shown that at the onset of type 1 diabetes, a time of physiological and emotional changes, youth with new-onset type 1 diabetes exhibit higher rates of depressive symptoms than peers. In a 2-year study, Grey et al. [7] found that children with new-onset diabetes scored significantly higher on the Children's Depression Inventory (CDI) than peers at baseline (diabetes: 4.7 ± 2.1, peers: 3.8 ± 2.6). At 1 year, both groups' scores were non-significantly lower than baseline and were no longer significantly different from one another. Two years later, children with diabetes again had scores that were significantly higher than peers (diabetes: 6.8 ± 2.6, peers: 3.7 ± 1.9). Although absolute CDI scores were low in both groups, 20% of subjects with type 1 diabetes scored above the clinical cutoff of 13 at 2 years post diagnosis, compared with only 7.5% of controls. In a cohort of youth followed for 6 years after diagnosis, Kovacs et al. [19] studied depressive symptoms over time. At the initial visit, the mean CDI score was 6.52 ± 4.55; in the years that followed, the mean CDI scores changed slightly from year to year, but the mean scores remained <3.5 for the entire follow-up. In a recent large study of 1,026 adolescents with recent-onset type 1 diabetes (duration 10.4 ± 6.5 months), Hood et al. found no significant difference in depressive symptoms (measured by the Center for Epidemiological Studies Depression scale [CES-D]) at 1 year compared with baseline [20].

Depressive symptoms are also common in youth with established type 1 diabetes treated with insulin pump therapy. In a study of 372 adolescents in Poland with established type 1 diabetes treated with pump therapy, Zdunczyk et al. found that 18% of participants with hemoglobin A1c (HbA1c) in target range (<7.5%) and 21% of those with HbA1c above target range (≥7.5%) reported depressive symptoms [21]. For comparison, another study of teens with established type 1 diabetes followed for 1 year revealed that those treated with multiple daily injections and those treated with pump therapy had similarly low CDI scores at baseline and at 6 and 12 months (mean ranging from 2.0 to 2.5) [22].

Most of these studies assessed depressive symptoms in youth with type 1 diabetes using older insulin formulations and technologies. Few recent studies have examined patterns of depressive symptoms in children and adolescents with type 1 diabetes at diagnosis and at initiation of pump therapy, two key stages of the disease and treatment process. Our aim was to investigate the level of depressive symptoms and factors associated with reports of more depressive symptoms in youth with new-onset type 1 diabetes and in youth beginning insulin pump therapy, and to prospectively follow and compare the course of depressive symptoms in these two groups of youth over 1 year, an understudied area to date. We hypothesized that rates of depressive symptoms might be equivalent in the two groups: the new-onset group may be reacting acutely to a new diagnosis, whereas the pump group may have depressive symptoms related to having a chronic disease.

Methods

Participants and procedures

This was a secondary analysis of a 1-year observational prospective study conducted at three pediatric diabetes centers in the U.S. [23]. A total of 103 youths ages 10–17 years were identified and recruited within 10 days of diagnosis of type 1 diabetes (n = 58) or insulin pump therapy initiation (n = 45). Those with psychiatric comorbidities or coexisting disorders affecting weight or metabolism were ineligible. Study visits occurred at baseline and at 1, 6, and 12 months. Participants only seen at baseline and at 1 month were excluded (new onset, n = 4; pump, n = 3) because the prespecified analysis plan called for an assessment of depressive symptoms over time. The final data set included 54 youths in the new-onset group and 42 youths in the pump group. The protocol was approved by each site's institutional review board. Parents/youth provided written informed consent/assent before beginning any study procedures. Each site performed study procedures according to a unified protocol.

Chart review and interview provided demographic and biomedical data. Baseline data included sex, age, age at diagnosis, race, and family factors (household income, parental marital status, and parental education). Data collected at baseline and across time included height, weight, insulin treatment, and HbA1c. Age- and sex-adjusted body mass index percentiles and body mass index *z*-scores (zBMI) were calculated according to the Centers for Disease Control and Prevention growth charts [24]. HbA1c was measured using point-of-care devices at each site standardized