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Seasonal Trends in Depressive Symptoms in Adolescents with Type 1 Diabetes

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Summary

Adolescents with type 1 diabetes reported more clinically significant depressive symptoms in the spring/summer months (22% in April–September) than in the fall/winter months (11% in October–March) ($\chi^2 = 5.67$, $p = .018$). This seasonal pattern was stronger in low-income adolescents than in adolescents from higher-income families.

Adolescents with type 1 diabetes are at increased risk for depression; a recent multi-center study found that 14% of youth ages 10–21 had mild symptoms, and another 8.6% had moderate/severe symptoms [1]. For these adolescents, depression may have serious consequences, including increased duration of depressive episodes and suicidal thoughts [2, 3]. Depressive symptoms have also been linked to poorer adherence and metabolic control, and increased risk for hospitalization [1, 4, 5]. Based on these findings, the American Diabetes Association recommends annual screening starting at age 10 [6]; however, no guidance is given as to optimal timing. Several risk factors have been identified for depression in youth with type 1 diabetes: it is more common in girls, older adolescents, lower SES, and non-white, non-Hispanic youth [1, 7, 8]. One factor that has not been studied in this population is seasonality, but other studies have found increased suicides in the spring [9, 10]. Based on clinical observations, we hypothesized that adolescents would be more likely to score above the clinical cutoff for depressive symptoms in the spring and summer months than in the fall and winter months.

Methods

This was a secondary analysis of baseline data from a multi-site randomized clinical trial of an internet-based intervention. Adolescents were eligible for the study if they were between the ages of 11–14, diagnosed for >6 months, English-speaking, and had no other major health problems. Recruitment occurred during clinic visits at four U.S. sites (Connecticut, Pennsylvania, Florida, and Arizona). Guardians completed demographic forms and IRB-

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Conflict of Interest

The authors declare that they have no conflict of interest.

approved consent/assent, and clinical data were collected from medical records. All other data were collected via a secure online database.

The Children's Depression Inventory (CDI) [11] a 27-item self-report measure, was used to assess depressive symptoms in youth. If adolescents scored above the clinical threshold of depressive symptoms (total score ≥ 12), trained staff (nurse or psychologist) called and conducted a depression assessment to determine if a referral was needed. The follow-up interviews used a semi-structured interview (the DSM-IV checklist for major depressive disorder, which assesses 9 symptoms of depression). Adolescents were also asked to comment on whether problems related to school, friends, family, or diabetes contributed to their symptoms of depression.

Results

Adolescents ($n = 320$) were 11–14 (mean age = 12.3 ± 1.1), 45% male, 63.8% White, 7.5% Black, 18.8% Hispanic, and 10% of more than one or other race/ethnicity. The majority (59%) were on pump therapy, mean duration of diabetes was $6.1 (\pm 3.5)$ years, mean A1C was $8.3\% (\pm 1.5)$, and mean CDI score was $6.42 (\pm 7.31)$. Seventeen percent ($n = 54$) of the adolescents scored above the clinical threshold of depressive symptoms.

Chi-square analyses indicated that there was not a significant effect for individual seasons on clinically significant CDI scores ($\chi^2 = 5.66$, $p = .130$). In the spring (April – June), 20.4% of adolescents had a clinically significant score; 19.6% in the summer (July – September); 6.5% in the fall (October – December); and 13.0% in the winter (January – March) (see Figure 1). Based on this pattern of results, we combined the spring/summer and fall/winter seasons and found a significant difference in CDI scores ($\chi^2 = 5.67$, $p = .018$). Adolescents were twice as likely to score above the clinical threshold in the spring/summer months (22% in April – September) than in the fall/winter months (11% in October – March).

Demographic differences in this seasonal pattern of clinically significant CDI scores were evaluated using risk factors for depression (gender, age, SES, and race/ethnicity) (6). The only significant demographic variable was income; adolescents from the lowest income category ($< \$40K/\text{year}$) were significantly more likely score above the clinical threshold in the spring/summer seasons (21.9%) than those from both the middle income category (13.8% in $\$40\text{--}80K/\text{year}$), and highest income category (11.4% in $> \$80K/\text{year}$). Adolescents with clinically significant depressive symptoms had poorer glycemic control (mean A1C = 9.3 ± 1.4) = than those with depressive symptoms in the normal range (mean A1C = $7.2 \pm .6$, $F(1, 315) = 315.67$, $p < .001$).

Documentation from the depression assessments was analyzed using a content analysis method, and common themes were identified. In the spring months, many youth reported stress related to schoolwork (e.g., feeling overwhelmed by projects and tests at the end of the school year) and school transitions (e.g., moving from middle school to high school). A common theme in the summer months was social isolation; many adolescents reported they were less likely to see peers during the summer and expressed feeling “bored” and “lonely.” In the fall/winter months, adolescents reported problems with peers, family conflict (e.g., arguments with parents and siblings), and diabetes-related stress (e.g., tired of dealing with diabetes care, feeling guilty about bad numbers).

Discussion

Approximately 17% of our sample of young adolescents had clinically significant symptoms of depression. This rate is in line with previous estimates of the rate of depression among

youth with T1D (1). Adolescents with clinically significant symptoms of depression in our sample had significantly poorer glycemic control than those with depressive symptoms in the normal range, underlining the importance of screening for depression in this population [12]. While the diabetes-related stressors reported by youth in our study were similar to those found in other qualitative studies [13], adolescents in our multi-site sample were almost twice as likely to score above the clinical threshold in the spring/summer months (April to September) than in the fall/winter months (October to March). This difference was even more pronounced in low-income youth. We hypothesize that the strong seasonal trend identified in the low-income youth may be due to a lack of structured activities (e.g., camp) in the summer months, resulting in social isolation, which has been linked to depression in adolescents [14].

The current study is limited by the cross-sectional data; longitudinal studies are needed to track depressive symptoms within individuals across seasons [15]. Further, we did not have diagnostic information regarding depressive disorders in youth; however, sub-threshold symptoms of depression appear to confer significant risk for poor psychosocial and physiological outcomes [5]. In addition, adolescents in our sample agreed to participate in an 18-month clinical trial of a behavioral intervention, so they may not be representative of youth with type 1 diabetes.

This is the first study to examine seasonal trends in depressive symptoms in a diverse sample of youth with type 1 diabetes. While more research is indicated, health care providers may consider assessing for depression during the spring and summer months, particularly in low-income youth.

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Figure 1.
Number of adolescents who scored above the clinical threshold on the CDI by month.