

## OBSERVATIONS

## Dietary Quality in Adolescents With Type 1 Diabetes

**R**ecent data demonstrate that youth with type 1 diabetes are not meeting established nutrition guidelines. However, comprehensive assessments of overall dietary quality in these youth are lacking, and it is unclear whether their dietary quality differs from that of their peers without diabetes. Therefore, we assessed comprehensive dietary quality in 50 adolescents with type 1 diabetes (mean age  $14.9 \pm 1.9$  years, 54% male, 80% non-Hispanic white, 65% with household income  $\leq 75,000$  USD, diabetes duration  $6.2 \pm 4.0$  years, and  $HbA_{1c}$   $8.9 \pm 1.5\%$ ) and 40 demographically similar adolescents without diabetes (mean age  $14.9 \pm 1.9$  years, 48% male, 85% non-Hispanic white, and 59% with household income  $\leq 75,000$  USD) and sought to identify correlates of dietary quality. Individuals with other conditions affecting dietary intake (e.g., celiac disease) were excluded. This study has institutional review board approval. Dietary quality was assessed via U.S. Department of Agriculture–validated Healthy Eating Index-2005 (HEI), calculated from standardized 24-h food recalls; good dietary quality is defined as a score of 81–100 (1). Youth with diabetes completed validated questionnaires of carbohydrate knowledge (PedsCarbQuiz [PCQ]), diabetes self-care adherence (Self Care Inventory [SCI]), and diabetes-related quality of life (Pediatric Diabetes-Related Quality of Life [PedsQL]) (2–4) and a questionnaire assessing beliefs about the relationship between food/diet and diabetes.

HEI scores were significantly lower in youth with type 1 diabetes than in those without diabetes ( $51.5 \pm 11.2$  vs.  $57.7 \pm 12.0$ ,  $P = 0.01$ ). This indicates that suboptimal dietary quality in adolescents with type 1 diabetes is due not only to secular trends but also to factors unique to children with type 1 diabetes. Rovner et al. (5) found similar dietary quality in

children and adolescents with type 1 diabetes (HEI score  $53.4 \pm 11.0$ ), suggesting that suboptimal dietary quality is a widespread problem among these youth.

Among youth with type 1 diabetes, HEI scores were not associated with diabetes duration, number of nutritionist visits,  $HbA_{1c}$ , SCI score, PedsQL score, or socioeconomic status. However, HEI scores were significantly correlated with carbohydrate knowledge as assessed by PCQ ( $r = 0.33$ ,  $P = 0.02$ ). We speculate that youth with greater carbohydrate-related knowledge eat a greater variety of fresh (rather than prepackaged) food because they are not dependent on prepackaged food labels in order to determine carbohydrate content.

Children with type 1 diabetes have been theorized to eat poorly as a result of overemphasis on carbohydrates. However, we did not find evidence for this in our study, as only a minority of participants endorsed statements that diabetes limited overall dietary freedom (14%), that concern about hyperglycemia limited fruit intake (6%), that avoidance of additional insulin dosing caused excessive consumption of “free foods” (40%), or that fear of hypoglycemia led to excessive consumption of carbohydrates (22%).

In conclusion, we found suboptimal dietary quality in youth with type 1 diabetes as well as demographically similar youth without diabetes, but youth with type 1 diabetes had even lower dietary quality scores. Among youth with diabetes in our sample, greater carbohydrate-related knowledge was the only correlate of better dietary quality. Interventions aimed at improving carbohydrate counting may therefore also have a positive impact on dietary quality.

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N.B. helped design the study, acquired data, contributed to the discussion, and wrote and edited the manuscript. L.C. helped design the study, contributed to the discussion, and reviewed and edited the manuscript. M.A.O. performed the statistical analyses. M.B.K. helped design the study, contributed to the discussion, and wrote and edited the manuscript. N.B. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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