

So What's the Difference Between Teenage Boys and Girls, Anyway?

The study by Cohn and coworkers (1) in this issue of *Diabetes Care* documents that adolescent females have significantly more episodes of ketoacidosis and hospitalizations related to diabetes than do males. Our multidisciplinary diabetes team has made similar observations of overall poorer glycemic control and more episodes of ketoacidosis caused by insulin omission and/or prolonged periods of poor control in teenage girls compared with teenage boys. In fact, we've coined the term *diabulimia* (2) to describe the behavior of a subset of these youngsters, mostly young girls, who learn that omitting insulin allows binge eating without weight gain. Instead of using laxatives or inducing vomiting, these patients omit insulin, producing sufficient glycosuria that excess food does not get converted to body fat. Of course, this is a rather dangerous tightrope to traverse because omitting too much insulin not only causes chronic hyperglycemia, glycosuria, and elevated glycohemoglobin levels but also catabolism of muscle mass as well as fat in a doomed-to-fail effort to supply energy to the body when insulin deficiency exists. If an intervening viral illness occurs in such people, ketoacidosis and severe dehydration may develop quickly with subsequent metabolic imbalance. When this condition is not recognized early, death may occur. Many of our patients seem to know when they are close to "the brink" and resume insulin despite their unwillingness to monitor urine/blood glucose levels on any regular basis. When they make mistakes, delay resumption of insulin too long, or are overcome by a fast-moving illness, intravenous fluids and insulin replacement, in either the emergency room or intensive care unit of a local hospital, are required.

Some boys, on the other hand, seem more likely to "act out" and rebel against the restraints of living with diabetes. Despite more abuse of alcohol by boys, we have not noted a clinical difference in episodes of severe hypoglycemia when comparing teenage boys and girls. Boys have less ketoacidosis and are not as "close to the edge" as frequently as are our adolescent and young adult female patients. Are they

smarter? Do they omit less insulin? Are there differences in adolescent health-risk behaviors that might explain the differences in diabetes-related behaviors? Is there some metabolic or hormonal difference in the consequences of noncompliance or nonadherence in young men versus young women? Might the cyclical menstrual changes in estrogen and progesterone levels (3) (compared to somewhat more steady testosterone levels in the boys) predispose girls to more metabolic decompensation? We simply do not have sufficient scientific data to answer such questions despite our knowledge that there is more insulin resistance during puberty in both sexes (4).

Although our treatments are better than ever, they remain nonphysiological under many circumstances. Despite the availability of human insulin and now insulin analogs and the ability of patients to self-monitor blood glucose levels and use urine ketone strips, our inability to structure diabetes care and provide flexibility leaves a great burden for most of our patients. There is no other chronic illness that requires so much daily attention of the patient. Perhaps the differences are psychological. What is it about young girls that produces the need to omit insulin more often than age-matched or Tanner-matched young boys? Is there more physical or sexual abuse of young teenage girls than boys and might this explain the eating difficulties and omitted insulin as well as the increased frequency of hospital care for young girls? Are these problems related to observations that adolescent females with diabetes are more likely to be overweight, and might this interact with females' greater concern about weight?

In the U.S. boys are more likely to be satisfied with their body shape or wish to increase their weight, while girls tend to be less satisfied with their body shape and size. African-American and Native American girls are more likely to be satisfied with their body shape and weight than whites (5), with African-Americans preferring a significantly heavier ideal body size compared to whites. Whites' preferences for body size are more influenced by peers,

while those of African-Americans are more influenced by family members (6). Forty percent of 9- to 10-year-old girls already are trying to lose weight (7). This continues through adolescence. Recent evidence suggests that chronic dieting behaviors are a reflection of psychological problems rather than a cause (8). It is not unreasonable to suspect that the perceived pressure among adolescent girls to weigh less is part of the problem. Is this same picture present outside of North America even though the levels of obesity are clearly different in other parts of the world? Does the information from Toronto (9) and Pittsburgh (10,11) as well as Boston (12,13) explain the differences presented in this California study?

To develop appropriate therapies (14) requires identification of the many factors related to less adherence to recommended treatment plans, including omission of insulin (15), and a greater understanding of adolescent (16), preadolescent, and family response to diabetes (17). Strategies include individual and group therapy (18–21), winter and summer camp programs, wilderness adventure programs (22), and empowerment programs (23,24) for children, adolescents, and family members (25). Such programs would allow us to provide guidance in preventive health to minimize or prevent destructive behavior (26,27). We must find the answers to these questions and then teach health providers how to help their adolescent patients learn better self-management behaviors. Our young peoples' lives and future health are at stake.

STUART BRINK, MD

From the New England Diabetes and Endocrinology Center, Waltham; Pediatric and Adolescent Diabetes and Endocrinology, Newton Wellesley Hospital, Newton; and the Department of Pediatrics, Tufts University School of Medicine, Boston, Massachusetts.

Address correspondence and reprint requests to Stuart Brink, MD, New England Diabetes and Endocrinology Center (NEDEC), 40 Second Ave., Suite #170, Waltham MA 02154-1132. E-mail: sbrink@opal.tufts.edu.

References

1. Cohn BA, Cirillo PM, Wingard DL, Austin

- DF, Rofers SD: Gender differences in hospitalizations for IDDM among adolescents in California, 1991: implications for prevention. *Diabetes Care* 20:1677-1682, 1997
2. Brink SJ: Pubertal and postpubertal diabetes (10- to 21-year olds). In *Pediatric and Adolescent Diabetes Mellitus*. Brink SJ, Ed. Chicago, Year Book Medical Publishers, 1987, p. 89-138
 3. Widom B, Diamond MP, Simonson DC: Alterations in glucose metabolism during the menstrual cycle in women with IDDM. *Diabetes Care* 15:213-220, 1992
 4. Amiel SA, Sherwin RS, Simonson DC, Lauritano AA, Tamborlane WV: Impaired insulin action in puberty: a contributing factor to poor glycemic control in adolescents with diabetes. *N Engl J Med* 315:215-219, 1986
 5. Story M, French SA, Resnick MD, Blum RW: Ethnic/racial and socioeconomic differences in dieting behaviors and body image perceptions in adolescents. *Int J Eating Disord* 182:173-179, 1995
 6. Parnell K, Sargent R, Thompson SH, Duhe SF, Valois RF, Kemper RC: Black and white adolescent females' perceptions of ideal body size. *J School Health* 663:112-118, 1996
 7. Schreiber GB, Robins M, Striegel-Moore R, Obarzanek E, Morrison JA, Wright DJ: Weight modification efforts reported by black and white preadolescent girls: National Heart, Lung, and Blood Institute Growth and Health Study. *Pediatrics* 98:63-70, 1996
 8. French SA, Perry CA, Leon GR, Fulkerson MA: Changes in psychological variables and health behaviors by dieting status over a three-year period in a cohort of adolescent females. *J Adolesc Health* 16:438-447, 1995
 9. Rodin GM, Daneman D: Eating disorders and IDDM. *Diabetes Care* 15:1402-1412, 1992
 10. Wing RR, Nowalk MP, Marcus MD, Koeske R, Finegold D: Subclinical eating disorders and glycemic control in adolescents with type 1 diabetes. *Diabetes Care* 9:162-167, 1986
 11. Kovacs M, Feinberg TL, Paulauskas S, Finkelstein R, Pollock M, Crouse-Novak M: Initial coping responses and psychosocial characteristics of children with insulin-dependent diabetes mellitus. *J Pediatr* 106:827-834, 1985
 12. Jacobson AM, Hauser ST, Willett JB, Wolford JI, Dvorak R, Herman L, de Groot M: Psychological adjustment to IDDM: 10-year follow-up of an onset cohort of child and adolescent patients. *Diabetes Care* 20:811-818, 1997
 13. Polonsky WH, Anderson BJ, Lohrer PA, Aponte JE, Jacobson AM, Cole, CF: Insulin omission in women with IDDM. *Diabetes Care* 17:1178-1185, 1994
 14. Steel JM: Eating disorders. In *Childhood and Adolescent Diabetes*. Kelnar CJH, Ed. London, Chapman & Hall Medical, 1994, p. 375-384
 15. Morris AD, Greene SA, Boyle DIR, MacDonald TM, Newton RW: Direct evidence of missing insulin as a cause of poor glycaemic control and diabetic ketoacidosis (Abstract). *J Pediatr Endocrinol Metab* 10 (Suppl. 2):345, 1997
 16. Offer D, Ostrov ER, Howard KI: Adolescence: what is normal? *Am J Dis Child* 143:731-736, 1989
 17. Orr DP, Golden MP, Myers G, Marrero D: Characteristics of adolescents with poorly controlled diabetes referred to a tertiary care center. *Diabetes Care* 6:170-175, 1983
 18. Wysocki T: *Ten Keys to Helping Your Child Grow Up With Diabetes*. Alexandria, VA, American Diabetes Association, 1997
 19. Grossman HY: The adolescent with insulin-dependent diabetes mellitus: psychological considerations. In *Pediatric and Adolescent Diabetes Mellitus*. Brink SJ, Ed. Chicago, Year Book Medical Publishers, 1987, p. 139-150
 20. Citrin W, Tapp JT, Wine HE: Diabetes counseling issues: the patient and the family. In *Pediatric and Adolescent Diabetes Mellitus*. Brink SJ, Ed. Chicago, Year Book Medical Publishers, 1987, p. 369-390
 21. Newton RW, Greene SA: Diabetes in the adolescent. In *Childhood and Adolescent Diabetes*. Kelnar CJH, Ed. London, Chapman & Hall Medical, 1994, p. 367-374
 22. Brink SJ: Diabetes camping. In *Diabetes and the Adolescent*. Court J, Ed. Camberwell, Australia, Miranova Publishers, 1997. In press
 23. Mühlhauser I, Bott U, Overmann H, Berger M: Liberalized diet in patients with type 1 diabetes. *J Intern Med* 237:591-597, 1995
 24. Betschart J, Thom S: *In Control. A Guide for Teens With Diabetes*. Minneapolis, MN, Chronimed Publishing, 1995
 25. Brink S, Siminerio L, Hinnen-Hentzen D, Deeb LC, Daly AS, Anderson BJ, Agrin RJ: *Diabetes Education Goals*. Alexandria, VA, American Diabetes Association, 1995
 26. Rubin RR, Biermann J, Toohey B: *Psyching Out Diabetes*. Van Nuys, CA, Prana Publications, 1992
 27. Anderson BJ, Rubin RR: *Practical Psychology for Diabetes Clinicians. How to Deal With the Key Behavioral Issues Faced by Patients and Health Care Teams*. Alexandria, VA, American Diabetes Association, 1996