

In Brief

Emerging research emphasizes the importance of an integrative approach to treating type 1 diabetes among adolescent females. This review discusses important biological, psychological, behavioral, and sociocultural factors that must be considered when providing diabetes care. A summary of recommendations to assist health care professionals in delivering care to their patients is provided.

Biopsychosocial Factors Affecting Metabolic Control Among Female Adolescents With Type 1 Diabetes

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In 2001, the Centers for Disease Control and Prevention (CDC) released a landmark monograph, "Diabetes and Women's Health Across the Life Stages: A Public Health Perspective."¹ In this publication, the CDC emphasized the complex nature of diabetes, discussed public health implications, described opportunities for research, and made recommendations. To further this discussion, this review addresses the unique biological, psychological, behavioral, and sociocultural challenges faced by adolescent females with type 1 diabetes, their families, and their health care providers.

The review begins with a discussion about how puberty may contribute to physical and emotional changes in adolescent girls with diabetes. For this population, important psychological and behavioral factors include stress and coping, depression, intentional health-compromising behaviors, and eating disorders; sociocultural factors include peer pressure and family interaction. Relevant research findings are provided to frame discussions, and recommendations are offered to improve care.

PUBERTY AND DIABETES

In 1990, an estimated 123,000 adolescents had diabetes, with 50% of this figure representing girls with type 1 diabetes.² During adolescence, a developmental phase often considered to begin at age 10 and end at age 19,

both boys and girls experience major hormonal changes that mediate secondary sexual characteristics and growth during puberty.² For young people burdened with type 1 diabetes, weight gain and dissatisfaction with body image are common complaints, particularly among girls.

The mechanisms underlying physical (e.g., weight gain) and emotional changes during puberty among adolescent girls with diabetes are not well understood.³ It has been argued that both insulin dose and frequency of insulin injection impair growth during puberty while increasing body fat in girls, although boys appear to be relatively unaffected.⁴ Elevated concentrations of growth hormone and reduced amounts of insulin-like growth factor-1, both commonly observed in type 1 diabetic patients, may also contribute to weight gain.⁴ Finally, leptin, a hormone produced by adipocytes, is thought to provide feedback through the hypothalamic receptors to regulate satiety, appetite, and energy metabolism and therefore also to contribute to the pathogenesis of excessive weight gain.⁴

Increases in body fat during puberty, a time when girls are becoming more concerned about their body shape and size and are particularly vulnerable to the opinions of peers (especially boys) may lead to intentional compromising in disease management. Weight gain may lead to disordered eating (to be discussed later),

omission of insulin, and intentional health-compromising behaviors, such as smoking or drinking.

Fortunately, during adolescence, patients and their families are more likely to be receptive to advice, recommendations, and medical intervention from health care providers. Discussion with patients, parents, or guardians should emphasize that puberty presents unique challenges as well as learning opportunities that vary from one young adolescent girl to another. Health care professionals should frequently remind all parties that young female patients with diabetes can and do survive adolescence and make the necessary transition to young adulthood. This transition can be facilitated by the collaborative efforts of patients, families, and health care providers in managing needs for diabetes care.

PSYCHOLOGICAL AND BEHAVIORAL FACTORS

Stress

Diabetes is a complex, demanding disease that can induce serious psychological stress, which in turn can inhibit patients' ability to self-manage the disorder. Stress also disrupts glycemic control through its effects on stress hormones (e.g., catecholamines and cortisol).⁵ The relationship between stress and diabetes has been explored extensively among adults but less among adolescents. Among adults, the effects of stress on people with diabetes vary in accordance with patients' coping abilities. Across studies, stress responses among adults with diabetes are highly idiosyncratic with high interindividual variability.⁶

For adolescents with diabetes, stress is a serious psychological condition that often does not receive proper attention from health care providers. Sources of stress for adolescent girls with diabetes include frequent changes in daily routines (e.g., timing of meals) that may affect glycemic control, academic challenges, interpersonal conflicts with family and peers, being newly diagnosed, and the onset of complications.^{7,8} These events are usually short-term, but if left untreated may lead to more serious dysfunction, e.g., depression. Farmer⁹ suggests that because stress during adolescence is often viewed as normal for this stage of development, its negative impact on overall health is minimized, and the condition may be misdiagnosed or missed altogether. Unfortunately, prolonged exposure to negative stressors

often leads to intentional health-compromising behaviors and disease mismanagement. Mental health specialists may be needed to help patients eliminate any intentional health-compromising behaviors and minimize the negative effects of chronic stress.

Depression

The etiology of depression is still poorly understood, and researchers have not been able to determine whether the cause of this condition differs between women with diabetes and other women or even men.¹⁰ Moreover, little is known about treating people burdened by both diabetes and depression, especially adolescent girls. The few available studies^{7,11} suggest there is no significant difference in how psychological disorders, including depression, are experienced between adolescents with diabetes and their peers without the disease.

Two longitudinal studies followed children or adolescents over 10 years to determine their prevalence of psychological disorders during adolescence.^{12,13} Kavacs et al.¹² followed 8- to 13-year-old children diagnosed with diabetes, most of them girls. Initial psychometric testing revealed evidence of depression and anxiety in this group. At the 1- and 7-year follow-ups, however, symptoms of both problems decreased. Jacobson et al.¹³ followed a group of adolescents diagnosed with diabetes and used adolescents diagnosed with acute illness as a control group. Comparison 10 years later found no significant differences in psychological disorders. The adolescents with diabetes had only minimal symptoms of depression but reported lower confidence and self-esteem. Some researchers believe that low levels of confidence and self-esteem during adolescence, if not addressed, could serve as a foundation for future psychological disorders, including depression.¹⁴

Conceptualization of depression in this population has not received adequate attention, however. Research^{15,16} suggests that future research on depression in adolescents must consider developmental stage and argues that adolescents may display symptoms of depression according to their developmental stage and experience the disorder differently than do other age-groups, particularly adults. Farmer⁹ suggests that adolescents may not directly complain of, or discuss, sadness, crying, or pessimism, all thought

to be signs of depression in adults.

Farmer⁹ recommends that parents and health care providers pay attention to more salient signs of depression, which include fatigue and sustained periods of anger. Health care providers should ask parents to be mindful of anger expressed through physical aggression and destruction of property. Should anger and fatigue persist, health care providers should explore the sources of these warning signs. Sources may include divorce, poor parenting skills, loss of a significant other, and impaired sibling and peer relationships.⁹ Health care providers largely consulted for diabetes-specific care may find it beneficial to encourage parents to consult a specialist in adolescent mental health. Collectively, the mental health specialist, health care provider, family, and patient can develop a treatment plan to improve psychological well-being, family functioning, and diabetes care.

Intentional Health-Compromising Behaviors

In their attempt to transition into adulthood, adolescents with or without diabetes may struggle with feelings of ambivalence and may intentionally engage in health-compromising behaviors.¹⁷ Some adolescents with diabetes report experiencing intentional health-compromising behaviors such as smoking,¹⁸ using alcohol,¹⁹ or engaging in sexual intercourse.²⁰ Both smoking and drug use have been associated with poorer metabolic control in type 1 diabetes.²¹

A recent study²² explored whether intentional health-compromising behaviors accounted for variances in diabetes mismanagement among adolescents and young adults. Participants had type 1 diabetes and used a regimen involving insulin administration, glucose monitoring, and meal planning. Overall, study participants had lower levels of involvement in intentional health-compromising behaviors than the general population, and those who engaged in such behaviors were more likely to mismanage their diabetes than were those who did not.

Adolescent girls with diabetes who intentionally engage in health-compromising behaviors may do so because of underlying stress, anxiety, peer pressure, or even depression. Health care providers should explore whether patients exhibit signs of anger or fatigue (which could signal depression) or prolonged exposure to sources of

chronic stress that could impair their ability to cope over time. Early diagnosis of stress will allow timely delivery of interventions to reconcile self-induced behaviors that compromise effective disease management.

Eating Disorders

Forming one's identity, conforming to the social norms of peer groups, minimizing differences from one's peers, seeking independence from parents, and dealing with issues of control are all common developmental processes among adolescents. Inappropriate psychological adjustment to these developmental processes has been attributed to eating disorders in the general adolescent population and is believed to contribute to a higher prevalence of eating disorders among adolescent girls. In addition, societal messages regarding what is considered attractive contribute to adolescents' concerns about their body image.²³

Available evidence indicates that adolescent girls learn from their families, teachers, friends, and the media that being thin defines beauty and attractiveness.²³ Mothers may play an especially important role, as a growing body of evidence implicates some mothers in shaping disordered eating among children at a very early age.²⁴ Mothers who are chronic dieters, controlling, emotionally unavailable, verbally abusive, dissatisfied with their body shape and size, or particularly affected by impressions of peers and family members increase the risk that adolescent girls with type 1 diabetes will develop disordered eating behaviors.²⁵

In addition, certain features of diabetes and its management may contribute to eating disorders among adolescent girls. Experts on diabetes, adolescents, and eating disorders assert that the cycle of weight gain and loss caused by omitting insulin, the trend toward a higher body mass index during adolescence, and dietary constraints collectively contribute to the association between eating disorders and type 1 diabetes.²⁶

Eating disorders such as anorexia nervosa, bulimia nervosa, binge eating, purging, excessive exercising, and food deprivation occur more often among adolescent girls with diabetes.^{26,27} Problems associated with disordered eating behaviors include increased ketoacidosis, hospitalization, and complications such as retinopathy, nephropathy, and neu-

ropathy.²⁸ Finally, Rydall et al.²⁸ found in a 4-year longitudinal study of adolescent girls with diabetes that those experiencing persistent eating disorders had poorer metabolic control, more recurrent episodes of ketoacidosis, and a higher prevalence of retinopathy than did those without disordered eating.

At a minimum, health care providers should monitor changes in medical outcomes (e.g., hemoglobin A_{1c} [A1C], weight loss, recurrent ketoacidosis) and ask important questions of patients and family members to help determine whether disordered eating is present. Experts in eating disorders encourage an integrated approach to the treatment of these conditions among adolescent girls with type 1 diabetes.²⁹ Treatment must deal with complex underlying psychosomatic problems inherent in these disorders and help patients to make the necessary modification of intentional mismanagement behaviors, such as avoiding insulin. A collaborative care management team consisting of a specialist in eating disorders, health care provider, patient, and family is needed. Collaborative care management should involve clinical care to improve metabolic control, diabetes self-management education to improve daily self-care practices, and psychotherapy to address clinical problems, the quality of family relationships, and unresolved feelings about diabetes.^{30,31}

SOCIOCULTURAL FACTORS

Peer Pressure

Peer pressure has been viewed as a means of coercing behaviors within peer groups based on social norms.³² Attachment to peer groups helps adolescents avoid feelings of alienation and isolation. Offer et al.³³ have argued that adolescents are not mature enough to function independently as adults and thus turn to peers for support and behavioral norms.

Several studies have explored the role that peers play in diabetes management among adolescents. For example, Ahlfield et al.³⁴ found that situations in which the diabetes regimen demands behaviors different from those of peers can be stressful to adolescents. Similarly, Delameter et al.³⁵ found that adolescents with type 1 diabetes had problems adhering to their regimen when among peers in various settings (e.g., school and restaurants). In another study, Thomas et al.³⁶ found that adolescents

with type 1 diabetes worried about how their peers reacted to their type 1 diabetes.

Thomas et al.³⁶ also explored problem-solving and diabetes regimen adherence by children and adolescents aged 8–17 years with type 1 diabetes. They found that children and adolescents with type 1 diabetes often encountered conflict between maintaining their regimen and social acceptance. Study participants were segmented into developmental age-groups (8–10, 11–14, and 15–17 years) and were presented two vignettes dealing with diet, consuming alcohol, eating sweets, and timing meals.

Participants were generally aware of problem-solving strategies but were more likely to conform to peer influence. Those in the 11–14 and 15–17 age-groups selected actions that were significantly more peer acceptable than did those in the 8–10 group. Adolescents who deviate from strict adherence because of peer influence may be in the process of learning just how much they can flex the rules of adherence.³⁶ Deviations from strict adherence, if managed properly, can help adolescents develop the ability to self-manage diabetes under different social situations.

Findings from previous research confirm what has been known about the influence of peers in shaping health decisions during adolescence. Correspondingly, providers must consider the role of peer pressure in shaping diabetes self-management among adolescents. One suggestion, based on previous research,³⁶ would be to present patients with scenarios involving dietary practices (e.g., timing meals, consuming alcohol, and eating sweets). Health care professionals could use patient feedback to identify whether peer influence (supportive or nonsupportive) occurs, how it occurs, and under what conditions and in what settings it occurs. Providers could then work with patients to proactively tailor effective and realistic self-management strategies that could be used when patients feel they must conform to peer pressure.

Family Interaction

A growing body of research regarding family interaction and chronic disease management is available. The concept of family is now being defined more broadly as “the nexus of people living together or in close contact that have a history and a future, who take care of

one another and provide guidance for dependent members of the group."³⁷

Two important constructs have been used in family research to describe family dynamics: family structure and family functioning.³⁸ Family structure, which sets one family apart from another, refers to people within and outside of the family system. Family functioning refers to patterns within relationships that connect family members. There are many different aspects of family functioning, such as social cohesion, problem-solving style, affective expression, behavioral control, and flexibility.³⁸

Families cannot escape diabetes because it affects every member emotionally, cognitively, and behaviorally.^{38,39} In addition, families must deal with the demands (e.g., loss of privacy, spontaneity, and work opportunities) that emerge in response to the presence of a chronic condition such as type 1 diabetes.

Mengal et al.⁴⁰ found that mothers who were excessively anxious and fathers who were withdrawn or less involved in disease management had a negative effect on metabolic control among adolescents. In general, par-

ents who are not available to provide emotional support and diabetes monitoring place adolescents at increased risk for stress, anxiety, depression, and intentional health-compromising behaviors. Parents who provide individualized emotional support and diabetes monitoring based on developmental level, temperament, and family circumstances are more likely to minimize parent-adolescent conflict. According to Patterson, "Each family has its own particular strengths or resources, as well as limitations or demands that affect how chronic illness is managed."⁴¹

Anderson et al.⁴² designed and evaluated an office-based intervention aimed at maintaining parent-adolescent teamwork in diabetes management. They found that families assigned to the teamwork condition were able to avoid low and high blood glucose levels, maintain parental involvement in disease management without shaming or blaming, demonstrate less family conflict, maintain realistic expectations for blood glucose levels and behaviors during early adolescence, and achieve better overall metabolic control. Their findings were

consistent with those generated by Delamater et al.,⁴³ who used a similar family-based intervention targeting parents and adolescents diagnosed with type 1 diabetes.

The challenge for health care providers is twofold: to enhance family protective factors by helping adolescents identify and develop their capabilities, and to identify and reduce their risk factors (e.g., inability to manage stress, lack of cohesion, poor family organization) in an effort to achieve balanced family functioning. Health care providers must realize there is no right or best way for families to function. Consistent with the family-centered interventions used by Anderson et al.⁴² and Delamater et al.,⁴³ health care providers should help families clarify flexible rules, realistic expectations, and essential family routines to ensure daily effective management of type 1 diabetes.

SUMMARY AND CONCLUSION

This review describes adolescence as an important developmental phase that presents unique challenges and opportunities to adolescent girls with diabetes, their families, and their

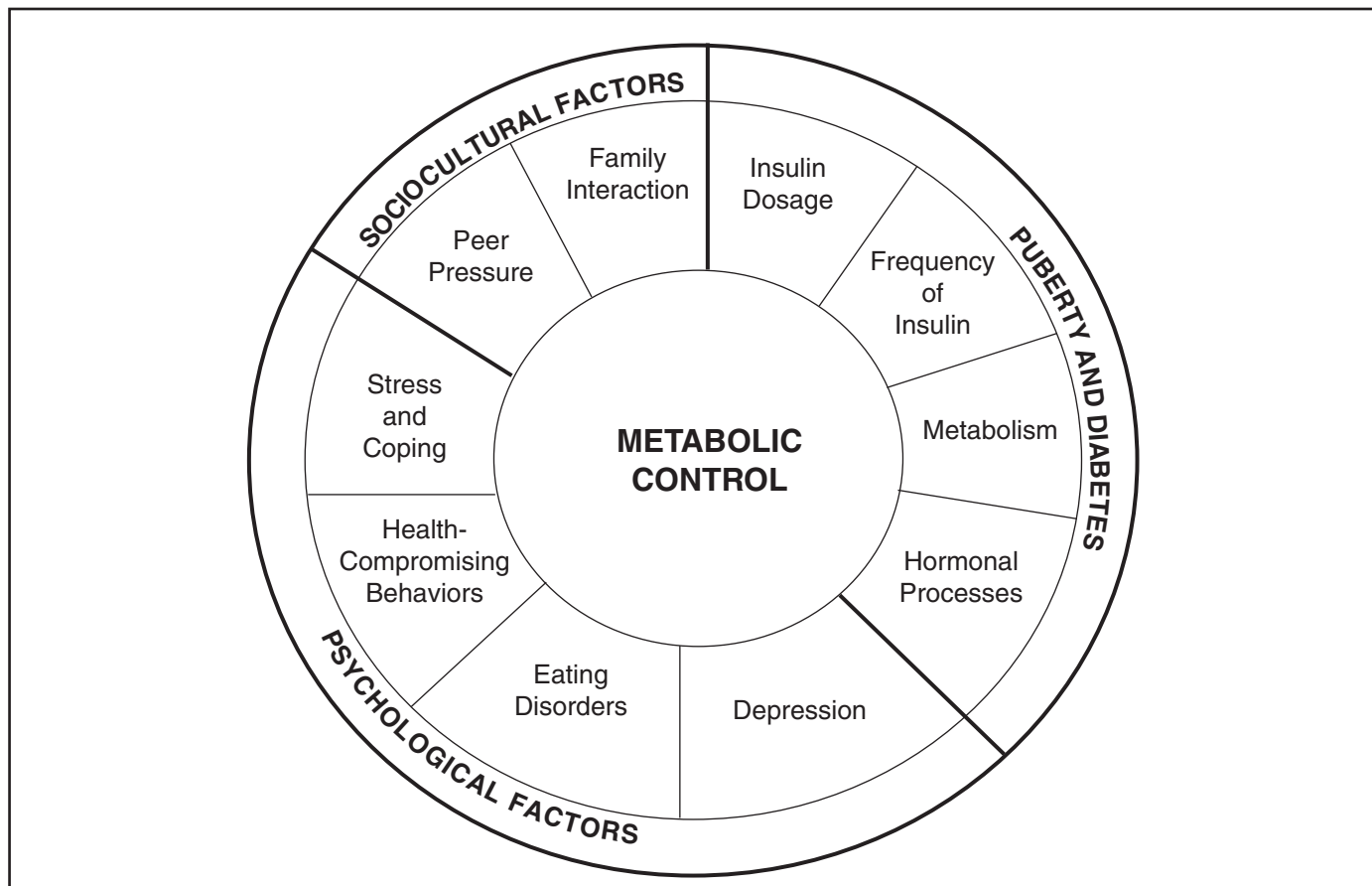


Figure 1. The cyclic effects of biopsychosocial factors on metabolic control for type 1 diabetes.

health care providers. Figure 1 illustrates how type 1 diabetes further complicates adolescence, given that the disease necessitates interaction among biological, psychological, behavioral, and sociocultural factors in a cyclic, multidimensional fashion.

Biologically, adolescent girls with diabetes experience unintentional weight gain during puberty, a time when they are more likely to be concerned about body size and shape. Insulin doses, frequency of insulin injections, and complex metabolic and hormonal processes have been theorized to contribute to weight gain. Psychological and behavioral concerns that can impair the abilities of patients and families to effectively manage type 1 diabetes include depression, stress, intentional health-compromising behaviors, and eating disorders. Peer pressure and family interaction represent examples of the sociocultural contexts in which diabetes care is shape and managed.

Emerging research emphasizes the importance of an integrative approach to treating type 1 diabetes among adolescent girls.⁴⁴ During patients' adolescence, health care providers must consider each of the important domains—the biological, psychological, behavioral, and sociocultural. This review has provided recommendations that can enhance diabetes care in this age-group. Table 1 offers a summary of these recommendations.

The need to pay attention to multiple factors that go beyond medical outcomes (e.g., A1C, glycemic control, microvascular complications) has been emphasized throughout this article. When providing care properly and consistently, health care professionals can aid the cognitive and emotional development of adolescent girls with diabetes. If all goes well, we can improve health outcomes among this vulnerable population and make their transition from adolescence to young adulthood less difficult.

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Table 1. Recommendations to Enhance Care for Adolescent Girls With Type 1 Diabetes

Biopsychosocial Factor	Recommendations
Puberty Insulin dose and frequency, metabolism, and hormonal changes	Understand that these factors may affect growth during puberty and increase body fat, which may affect body image and satisfaction.
Psychological factors Stress	Explore sources of prolonged negative stress, which may include frequent changes in daily routines, academic challenges, interpersonal conflicts with peers, and the shock of being newly diagnosed with diabetes. Work collaboratively with the patient and family on ways to eliminate sources of stress and enhance coping abilities.
Depression	Identify signs of depression, such as fatigue and sustained periods of anger. If necessary, consult a mental health specialist.
Intentional health-compromising behaviors	Identify underlying sources of stress, anxiety, and depression that may impair coping abilities. If necessary, consult a mental health specialist.
Eating disorders	Ask questions to determine whether eating disorders are a problem. Monitor changes in medical outcomes such as weight and A1C. If necessary, use a collaborative approach involving an expert in eating disorders, the patient, and the family.
Sociocultural factors Peer pressure	Seek feedback from patients to understand if peer influence occurs and, if so, under what conditions and in what settings.
Family interaction	Assist family with enhancing protective factors and eliminating family dysfunction so as to improve the management of diabetes.

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