



# Diabetes in Children and Adolescents

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Diabetes is one of the most serious health problems facing the world today. In the United States each year, more than 13,000 children are diagnosed with type 1 diabetes. Increasingly, health care providers are finding more and more children and teens with type 2 diabetes, a disease usually seen in people over age 40. Although there are no national data, some clinics report that one-third to one-half of all new cases of childhood diabetes are now type 2. African American, Hispanic/Latino and American Indian children who are obese and have a family history of type 2 diabetes are at especially high risk for this type of diabetes.

## **What is Diabetes?**

Diabetes is a chronic disease in which the body does not make or properly use insulin, a hormone that is needed to convert sugar, starches, and other food into energy. People with diabetes have increased blood glucose (sugar) levels due to a lack of insulin, insufficient insulin, or resistance to insulin's effects. High levels of glucose build up in the blood, and spill into the urine and out of the body. As a result, the body loses its main source of fuel.

Taking care of diabetes is important. If not treated, diabetes can lead to serious problems. Diabetes can affect the eyes, kidneys, nerves, gums, teeth, and blood vessels. Diabetes is the leading cause of adult blindness, lower limb amputations, and kidney failure. It can cause heart disease and stroke, and even death if untreated. Some of these problems can occur in teens and young adults who develop diabetes during childhood. Research in adults shows that these problems can be greatly reduced or delayed by keeping blood glucose levels near normal.

## **What are Special Concerns for Children and Adolescents with Diabetes?**

Diabetes presents unique issues for children and teens with the disease. Simple things - like going to a birthday party, playing sports, or staying overnight with friends - need careful planning. Every day, children with diabetes may need to take insulin or oral medication. They also need to check their blood glucose several times during the day and remember to make correct food choices. For school-age children, these tasks can make them feel "different" from their classmates. These tasks can be particularly bothersome for teens.

For any child or teen with diabetes, learning to cope with the disease is a big job. Dealing with a chronic illness such as diabetes may cause emotional and behavioral challenges. Talking to a social worker or psychologist may help a child or teen and his or her family learn to adjust to lifestyle changes needed to stay healthy.

### **What Can Families and Others Do?**

Managing diabetes in children and adolescents is most effective when the entire family makes a team effort. Families can share concerns with physicians, diabetes educators, dietitians, and other health care providers to get their help in the day-to-day management of diabetes. Extended family members, teachers, school nurses, counselors, coaches, day care providers, or other resources in the community can provide information, support, guidance, and help with coping skills. These individuals also may help with resources for health education, financial services, social services, mental health counseling, transportation, and home visiting.

Diabetes is stressful for both the children and their families. Parents should be alert for signs of depression or eating disorders and seek appropriate treatment. While all parents should talk to their children about avoiding tobacco, alcohol, and other drugs, this is particularly important for children with diabetes. Smoking and diabetes each increase the risk of cardiovascular disease and people with diabetes who smoke have a greatly increased risk of heart disease and circulatory problems. Binge drinking can increase the risk of hypoglycemia (low blood sugar) and symptoms of hypoglycemia can be mistaken for those of intoxication and not properly treated. Local peer groups for children and teens with diabetes can provide positive role models and group activities.

### **What Are the Types of Diabetes?**

There are two main types of diabetes. Type 1 and type 2 diabetes are described below. A third type-gestational diabetes-occurs only during pregnancy and often resolves after pregnancy. Women who have had gestational diabetes are more likely to develop type 2 diabetes later in life. (See "Resources" for information on gestational diabetes.)

#### **Type 1 Diabetes**

Type 1 diabetes is a disease of the immune system, which is the body's system for fighting infection. In people with type 1 diabetes, the immune system attacks the beta cells, the insulin-producing cells of the pancreas, and destroys them. The pancreas can no longer produce insulin, so people with type 1 diabetes need to take insulin daily to live. Type 1 diabetes can occur at any age, but the disease occurs most often in children and young adults.

Symptoms. The symptoms of type 1 diabetes usually develop over a short period of time. They include increased thirst and urination, constant hunger, weight loss, and blurred vision. Children may also feel very tired all the time. If not diagnosed and treated with insulin, the child or teen with type 1 diabetes can lapse into a life-threatening diabetic coma, known as diabetic ketoacidosis (KEY-toe-asi-DOE-sis) or DKA.

Risk Factors. Though scientists have made much progress in predicting who is at risk for developing type 1 diabetes, they do not know exactly what triggers the immune system's attack on beta cells. They believe that type 1 diabetes is due to a combination of genetic and environmental factors. Researchers are working to identify these factors and stop the auto-immune process that leads to type 1 diabetes.

### **Type 2 Diabetes**

The first step in the development of type 2 diabetes is often a problem with the body's response to insulin, called insulin resistance. For reasons scientists do not completely understand, the body cannot use the insulin very well. This means that the body needs increasing amounts of insulin to control blood glucose. The pancreas tries to make more insulin, but after several years, insulin production may drop off.

Type 2 diabetes used to be found mainly in adults who were overweight and age 40 or older. Now, as more children and adolescents in the United States become overweight and inactive, type 2 diabetes occurs more often in young people. Type 2 diabetes is also more common in certain racial and ethnic groups, such as African Americans, American Indians, Hispanic/Latinos, and some Asian and Pacific Islander Americans. To control their diabetes, children with type 2 diabetes may need to take oral medication, insulin, or both.

Symptoms. Type 2 diabetes develops slowly in some children, but quickly in others. Symptoms may be similar to those of type 1 diabetes. A child or teen can feel very tired, thirsty, or nauseated (sick to the stomach), and have to urinate often. Other symptoms may include weight loss, blurred vision, frequent infections, and slow healing of wounds or sores. Some children or adolescents with type 2 diabetes may show no symptoms at all when they are diagnosed. For that reason, it is important for parents and caregivers to talk to a health care provider about testing children or teens who are at high risk for the disease.

Risk Factors. Being overweight, being older than 10 years of age, experiencing puberty, and having a family member who has type 2 diabetes are risk factors for the disease. Certain populations, as noted above, are at higher risk. In addition, physical signs of insulin resistance, such as acanthosis nigricans (A-can-tho-sis NIG-reh-cans), may appear: the skin around the neck or in the armpits appears dark, thick, and velvety. High blood pressure also may be a sign of insulin resistance. For children and teens at risk, health care providers can encourage, support, and educate the entire family to make lifestyle changes that may delay - or prevent - the onset of type 2 diabetes. Such lifestyle changes include keeping at a healthy weight and staying active.

### **What Should a Child or Teen With Diabetes Do Every Day?**

To control diabetes and prevent complications, blood glucose levels must be as close to a "normal" range as safely possible. Families should work with a health care provider to help set a child's or teen's targets for blood glucose levels. (See for Resources information

on target ranges.) The provider can help develop a personal diabetes plan for the child and discuss ways to manage hypoglycemia (low blood glucose) and hyperglycemia (high blood glucose).

### **A Personal Diabetes Plan**

A personal diabetes plan ensures that a daily schedule is in place to keep a child's diabetes under control. A health care provider develops this plan in partnership with a child or teen and his or her family. The plan shows the child or teen how to follow a healthy meal plan, get regular physical activity, check blood glucose levels, and take insulin or oral medication as prescribed.

Follow a Healthy Meal Plan. A child or teen needs to follow a meal plan developed by a physician, diabetes educator, or a registered dietitian. A meal plan outlines proper nutrition for growth. A meal plan also helps keep blood glucose levels in the target range. Children or adolescents and their families can learn how different types of food - especially carbohydrates such as breads, pasta, and rice - can affect blood glucose levels. Portion size, the right amount of calories for the child's age, and ideas for healthy food choices at meal and snack time also should be discussed. Family support for following the meal plan and setting up regular meal times is a key to success, especially if the child or teen is taking insulin.

Get Regular Physical Activity. A child or teen with diabetes needs regular physical activity. Exercise helps to lower blood glucose levels, especially in children and adolescents with type 2 diabetes. Exercise is also a good way to help children control their weight. If possible, a child or teen should check blood glucose levels before beginning a game or sport. A child or teen should not exercise if blood glucose levels are too low.

Check blood glucose levels regularly. A child or teen should check blood glucose levels regularly with a blood glucose meter, preferably a meter with a built-in memory. A health care professional can teach a child how to use a blood glucose meter properly and how often to use it. Blood glucose meter results show if blood glucose levels are in the target range, too high, or too low. A child should keep a journal or other records of blood glucose results to discuss with his or her health care provider. This information helps the provider make any needed changes to the child's or teen's personal diabetes plan.

Take all diabetes medication as prescribed. A child or teen should take all diabetes medication as prescribed. Parents, caregivers, school nurses, and others can help a child or teen learn how to take medications properly. For type 1 diabetes, a child or teen takes insulin shots at regular times each day. Some children and teens use an insulin pump, which delivers insulin. Some children or teens with type 2 diabetes need oral medication or insulin shots or both. In any case, all medication should be balanced with food and activity every day.

## **Hypoglycemia and Hyperglycemia**

Keeping blood glucose levels within the target range is the goal of diabetes control. However, extremes in blood glucose levels can occur for several reasons. The parent or caregiver should talk with a health care provider about how to deal with these potential problems related to a child's or teen's diabetes.

Blood glucose levels can sometimes drop too low - a condition called hypoglycemia (hi-po-gly-SEE-me-uh). Taking too much diabetes medicine, missing a meal or snack, or exercising too much may cause hypoglycemia. A child or teen can become nervous, shaky, and confused. When blood glucose levels fall very low, the person can lose consciousness or develop seizures. Talk to the child's or teen's health care provider about how to deal with this serious but manageable condition.

Blood glucose levels can sometimes rise too high - a condition known as hyperglycemia (hi-per-gly-SEE-me-uh). Forgetting to take medicines on time, eating too much, and getting too little exercise may cause hyperglycemia. Being ill also can raise blood glucose levels. Over time, hyperglycemia can lead to serious health problems and cause damage to the eyes, kidneys, nerves, blood vessels, gums, and teeth.

## **Are There Legal Considerations for Children and Teens with Diabetes?**

Several Federal and state laws provide protections to children with disabilities, including children or teens with diabetes. These children must have full access to public programs, including public schools, and to most private schools as well. Students with diabetes are entitled to accommodations and modifications necessary for them to stay healthy at school and have the same access to an education as other students do.

A child's or teen's school should prepare a plan that outlines how the child's special health care needs will be met. The plan should identify school staff responsible for making sure the plan is followed. The parents should be present during development of the plan. Any changes to the plan should be made only with the parents' consent. Ideally, the plan should be updated every year. For information or questions about the Americans With Disabilities Act, call 1-800-514-0301 or 1-800-514-0383 (TDD), or go to [www.usdoj.gov/crt/ada/](http://www.usdoj.gov/crt/ada/) on the World Wide Web.

## **Are researchers studying diabetes in children and adolescents?**

As the lead Federal Government agency for diabetes research, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducts and supports a wide range of research aimed at finding ways to prevent and treat diabetes and its health complications. The Institute's research on type 1 diabetes focuses on understanding its causes, improving treatment, and developing new therapies that could prevent or cure diabetes. In addition, NIDDK recently created Trialnet, a clinical trials network to test new ways to prevent type 1 diabetes and to preserve beta cell function in people who already have diabetes.

NIDDK is also setting up clinical centers to study the prevention and treatment of type 2 diabetes in children and adolescents. Treatment trials will look at lifestyle changes and drug therapy. Prevention trials will develop programs that can be used in schools and communities to lower risk factors for the disease. Other NIDDK-supported research on type 2 diabetes seeks to understand the causes of the disease, improve diagnosis, and develop new treatments. For more information about NIDDK research on children and adolescents with diabetes, visit [www.niddk.nih.gov/patient/patient.htm](http://www.niddk.nih.gov/patient/patient.htm) on the Internet.

In 2000, the Centers for Disease Control and Prevention (CDC) began funding a 5-year multi-center study of childhood diabetes. Participating centers are located in California, Colorado, Hawaii, Ohio, South Carolina, and Washington. The goals of the program are to 1) develop population-based registries of childhood diabetes, 2) characterize the types of diabetes, 3) develop case definitions and study the prevalence and incidence of the different types of childhood diabetes, and 4) describe the natural history and the quality of care received during follow-up. For more information, call 1-877-232-3422 or visit <http://www.cdc.gov/diabetes/projects/cda2.htm> on the Internet.

NIDDK and CDC are joint sponsors of the National Diabetes Education Program (NDEP). The goal of this program is to reduce illness and death associated with diabetes and its complications. The NDEP has developed an initiative to help health care providers identify, diagnose, and treat children and teens with type 2 diabetes. In addition, the NDEP will launch an initiative to increase awareness in the school setting about the importance of helping children and teens with diabetes manage their disease.

## **Resources**

For more information about diabetes, target goals for blood glucose levels, educational materials, and support programs for people with diabetes and their families and friends, contact:

National Diabetes Education Program (NDEP)

1 Diabetes Way

Bethesda, MD 20892-3600

Toll-free: 800-438-5383

Website: [www.ndep.nih.gov](http://www.ndep.nih.gov)

For more information about type 1, type 2, and gestational diabetes, as well as diabetes research, statistics, and education, contact:

National Diabetes Information Clearinghouse

1 Information Way

Bethesda, MD 20892-3560

Toll-free: 800-860-8747

Phone: (301) 654-3327

Fax: (301) 907-8906

Email: [ndic@info.niddk.nih.gov](mailto:ndic@info.niddk.nih.gov)

Website: [www.niddk.nih.gov/health/diabetes/diabetes.htm](http://www.niddk.nih.gov/health/diabetes/diabetes.htm)

Centers for Disease Control and Prevention  
National Center for Chronic Disease Prevention and Health Promotion  
1600 Clifton Road  
Atlanta, GA 30333  
Toll-free: 800-311-3435  
Phone: (404) 639-3311  
Fax: (770) 448-5195  
Website: [www.cdc.gov/nccdphp/index.htm](http://www.cdc.gov/nccdphp/index.htm)

CDC Division of Diabetes Translation  
Public Inquiries/Publications  
P.O. Box 8728  
Silver Spring, MD 20910  
Toll-free: 877-CDC-DIAB or 877-232-3422  
Fax: (301) 562-1050  
Email: [diabetes@cdc.gov](mailto:diabetes@cdc.gov)  
Website: [www.cdc.gov/diabetes](http://www.cdc.gov/diabetes)

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1701 N. Beauregard Street  
Alexandria, VA 22311  
Toll-free: 800-DIABETES or 800-342-2383  
Phone: (703) 549-1500  
Email: [customerservice@diabetes.org](mailto:customerservice@diabetes.org)  
Website: [www.diabetes.org](http://www.diabetes.org)

Juvenile Diabetes Foundation International  
120 Wall Street, 19th Floor  
New York, NY 10005  
Toll-free: 1-800-223-1138  
Phone: (212) 785-9500  
Website: [www.jdf.org](http://www.jdf.org)