

Alert

Pre-Diabetes and Type 2 Diabetes Mellitus in Children and Adolescents



Why the Alert?

- Pre-diabetes and type 2 diabetes in children and are growing public health problems.
- Type 2 diabetes represents 8-45%³ of pediatric patients with diabetes currently diagnosed in large pediatric centers in the United States.
- Young patients diagnosed with type 2 diabetes are generally overweight, typically inactive, have a strong family history of type 2 diabetes and often have signs of insulin resistance.
- The majority of these patients belong to ethnic groups at high risk for type 2 diabetes.
- Limited data suggest the likelihood of a higher prevalence of microvascular and macrovascular complications among young adults who develop type 2 diabetes during childhood.

Risk Factors

- Family history of diabetes (i.e., parents or siblings with diabetes or a mother with history of gestational diabetes mellitus [GDM])
- Children with Body Mass Index (BMI) at $\geq 85\%$ on CDC Growth Charts
- Ethnicity: African American, Hispanic/Latino American, Native American, Asian American, Pacific Islander
- Signs of insulin resistance or conditions associated with insulin resistance: acanthosis nigricans (AN)⁵, hypertension, dyslipidemia, polycystic ovarian syndrome (PCOS).

Prevention of Pre-Diabetes and Type 2 Diabetes in Children and Adolescents

Prevention in children and adolescents follows the same general approach as prevention in adults. However, assessment of family dynamics and family attitudes towards health and illness are important in the comprehensive prevention and management of type 2 diabetes.

- **Early identification**
 - Assess for risk factors above
 - Consider diagnostic testing for those children at risk, $\geq 85\%$ on CDC Growth Charts ($> 95\%$ on CDC Growth Charts – overweight)
 - Provide or refer for nutrition and physical activity counseling
- **Health care provider and community education regarding**
 - Weight management
 - Improved eating habits and general nutrition principles
 - Increased physical activity
 - Signs and symptoms of diabetes
 - Risk and prevention of long-term complications
 - Psychosocial impact of type 2 diabetes and need for ongoing behavior modification

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Diagnosis and Management of Pre-Diabetes and Type 2 Diabetes in Children and Adolescents

- **Pre-diabetes**
 - A. Impaired glucose tolerance (IGT): 2-hr plasma glucose (PG) ≥ 140 and < 200 mg/dL (from 75gm Oral Glucose Tolerance Test, OGTT) or,
 - B. Impaired fasting glucose (IFG): fasting plasma glucose (FPG) ≥ 100 and < 126 mg/dL
- **Diabetes**
 - A. Fasting plasma glucose (FPG) ≥ 126 mg/dL on two separate occasions or,
 - B. Casual blood glucose ≥ 200 mg/dL with symptoms

Management

Clinical Presentations

- Asymptomatic with Hyperglycemia:
Medical nutrition therapy and physical activity are required. If treatment goals are not met in three months, consider referring patient to a pediatric endocrinologist or other diabetes specialist and/or adding metformin.
- Symptomatic with Hyperglycemia:
Insulin is indicated if dehydration, or blood glucose > 400 mg/dL, ketosis and/or diabetic ketoacidosis (**DKA**) are present.

Goals and Recommendations

- Near normal plasma blood glucose:
 - Preprandial: 80-100 mg/dL
 - Postprandial: < 140 mg/dL
 - Bedtime: < 120 mg/dL
- A1C $< 7\%$ or less than 1% above lab norms; goals should be individualized to ensure safety
- Decrease the risk of the acute and chronic complications associated with diabetes

Life Style Changes

Work with patient and family to implement comprehensive self-management plans to include:

- Self-monitoring of blood glucose
- Increased physical activity
- Improved nutrition and eating habits
- Stress management
- Smoking cessation

Drug Therapy

Medications for treatment are limited.

- Metformin is approved for use in ages 10 years and older. Metformin is not used when a child is in DKA. No other single, combination or extended release medications are approved at this time for children.
- Insulin
- Combination therapy (metformin and insulin) may be indicated if no improvement with monotherapy.

References:

1. American Diabetes Association: Type 2 diabetes in children and adolescents. *Diabetes Care* 23:381-389, 2000.
2. Diabetes in Children Adolescents Work Group of the National Diabetes Education Program: An update on type 2 diabetes in youth from the National Diabetes Education Program. *Pediatrics* 114:259-263, 2004.
3. Fagot-Campagna A: Emergence of type 2 diabetes in children: epidemiological evidence. *J Pediatr Endocrinol Metab* 13 (Suppl 6):1395-1402, 2000.
4. Fagot-Campagna, A, et al.: Type 2 diabetes among North American children and adolescents: an epidemiologic review and a public health perspective. *J Pediatr* 136:665-672, 2000.
5. Useful website for information on Acanthosis Nigricans: www.cdc.gov/diabetes/news/docs/an.htm
6. Useful website for information on Body Mass Index: www.cdc.gov/growthcharts/

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