

watching and excessive dietary intake as well as the different rates of obesity observed in urban versus rural areas support the important influence of environment. One important risk factor is maternal obesity during pregnancy. Children born to obese mothers are three to five times more likely to be obese in childhood. Women who gain much more weight than recommended during pregnancy have children who have a higher BMI than normal in adolescence. Also, some small for gestational age (SGA) newborns have higher risks for abnormal postnatal weight gain and diabetes.

CLINICAL MANIFESTATIONS



Decision-Making Algorithm
Available @ StudentConsult.com

Obesity

Complications of obesity in children and adolescents can affect virtually every major organ system. High BMI increases the risk of metabolic and cardiovascular diseases and some cancers; it is also the most important modifiable risk factor for glycemia and diabetes. The history and physical examination should screen for many potential complications noted among obese patients (Table 29-1), in addition to specific syndromes associated with obesity (Table 29-2). Medical complications are often related to the degree of obesity and usually decrease in severity or resolve with weight reduction. Obesity is associated with the presence of precursors of coronary heart disease that are already evident in 12- and 13-year-old children. Type 2 diabetes is also increasing in children.

ASSESSMENT

The **diagnosis** of obesity depends on the measurement of excess body fat. Actual measurement of body composition is not practical in most clinical situations.

Table 29-1 Complications of Obesity	
COMPLICATION	EFFECTS
Psychosocial	Peer discrimination, teasing, reduced college acceptance, isolation, depression, eating disorders (binge-eating), reduced job promotion*
Growth	Advance bone age, increased height, early menarche
Central nervous system	Pseudotumor cerebri
Respiratory	Obstructive sleep apnea
Cardiovascular	Hypertension, cardiac hypertrophy, arrhythmias, ischemic heart disease,* sudden death*
Orthopedic	Slipped capital femoral epiphysis, Blount disease
Metabolic	Insulin resistance, type 2 diabetes mellitus, hypertriglyceridemia, hypercholesterolemia, gout,* hepatic steatosis, polycystic ovary disease, cholelithiasis

*Complications unusual until adulthood.

BMI (body mass index; $BMI = wt \text{ (kg)} \div Ht^2 \text{ (m)}$) is a convenient screening tool that correlates fairly strongly with body fatness in children and adults. **BMI age-specific and gender-specific percentile curves** (for 2- to 20-year-olds) allow an assessment of BMI percentile (available online at <http://www.cdc.gov/growthcharts>). Table 29-3 provides BMI interpretation guidelines. For children younger than 2 years of age, weight-for-length measurements greater than 95th percentile may indicate overweight and warrant further assessment. A BMI for age and gender above the 95th percentile is strongly associated with excessive body fat and is associated with multiple cardiovascular disease risk factors.

Early recognition of excessive rates of weight gain, overweight, or obesity in children is essential because the earlier the interventions, the more likely they are to be successful.

Table 29-2 Diseases Associated with Childhood Obesity*	
SYNDROME	MANIFESTATIONS
Alström syndrome	Hypogonadism, retinal degeneration, deafness, diabetes mellitus
Carpenter syndrome	Polydactyly, syndactyly, cranial synostosis, mental retardation
Cushing syndrome	Adrenal hyperplasia or pituitary tumor
Fröhlich syndrome	Hypothalamic tumor
Hyperinsulinism	Nesidioblastosis, pancreatic adenoma, hypoglycemia, Mauriac syndrome
Laurence-Moon-Bardet-Biedl	Retinal degeneration, syndactyly, hypogonadism, mental retardation, autosomal recessive syndrome
Muscular dystrophy	Late onset of obesity
Myelodysplasia	Spina bifida
Prader-Willi syndrome	Neonatal hypotonia, normal growth immediately after birth, small hands and feet, mental retardation, hypogonadism; some have partial deletion of chromosome 15
Pseudohypoparathyroidism	Variable hypocalcemia, cutaneous calcifications
Turner syndrome	Ovarian dysgenesis, lymphedema, web neck; XO chromosome

*These diseases represent <5% of cases of childhood obesity.

Table 29-3 Body Mass Index (BMI)* Interpretation	
BMI/AGE PERCENTILE	INTERPRETATION
<5th	Underweight
5th–85th	Normal
85th–95th	Overweight
>95th	Obese

From www.cdc.gov/healthyweight.

$$* BMI = \frac{wt \text{ (kg)}}{Ht^2 \text{ (m)}}$$