Pediatric Obesity and Chronic Disease

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Objectives:

1. Risk factors for developing childhood obesity
2. Diagnosing obesity and initial workup
3. Common chronic diseases seen in childhood obesity
4. Addressing the issue in the clinical setting
Acknowledgements and Resources

* CDC website (cdc.gov)
* Talks from: Bruce Boston MD (endocrinology) and Daniel Marks MD, Ph.D. from OHSU.
* UpToDate 2016
* Contemporary Pediatrics
* AAP website and news
Childhood Obesity Facts:

* Childhood obesity has **doubled** in children and **quadrupled** in adolescents in the past 30 years.

* 1 in 3 children are considered overweight or obese.

* 2 in 3 children don’t get any daily physical activity.

* 22% of schools don’t require any physical education classes

* Kids average 7 hours of screen time per day.
Figure. Trends in obesity among children and adolescents aged 2–19 years, by sex: United States, selected years 1971–1974 through 2011–2012

NOTE: Obesity is body mass index greater than or equal to the sex- and age-specific 95th percentile from the 2000 CDC Growth Charts.
Why are our children getting fat?
Having one obese parent increases the risk of obesity by 2-3 fold and 15 fold if both parents are obese.

- Low income populations

- MC among American Indian, black, and Mexican Americans, than in non-Hispanic whites.
Risk Factors for Childhood Obesity-Environmental

- Sedentary lifestyle: TV/TV in the child's bedroom, video games, iPad, phones
- Less crosswalks and playgrounds for kids to use
- Advertisement of high glycemic foods, sugar sweetened beverages, increased portion sizes, fast food services
- School meal nutrition content – although there has been positive changes made, there is still sugar-sweetened beverages in our schools.
Increased Calorie Intake
Increased calorie drinks

* 1 out of 4 beverages is soft drinks
* 56% of 8 year olds drink soda daily
* Large soft drink has increased from 20 oz to 64 oz 960 calories
* 32 oz Fruit juice smoothie 600 calories
* 1 12 oz soda extra a day can result in 18-19 pound weight gain in a year
Cheap Food is Cheap!

Price indexes for selected foods and beverages, 1980-2010

Notes: Prices for each group are annual average prices for all urban consumers. All fruits and vegetables include fresh, canned, and frozen. Base period 1982-84=100.

Figure 1. Trends in childhood obesity among children and adolescents aged 3–19 in Canada and the United States

1Statistically significant difference compared with Canada, \( p < 0.001 \).
NOTE: Pregnant girls are excluded.
Defining Childhood Obesity

* **BMI - Body Mass Index**

* **BMI = Weight (kg)/Height (m)^2**

  Weight(lbs)/Height(in)^2 x 703

* Definitions for children 2 -20 years old:
  * **Normal weight** – BMI between 5^{th} and <85^{th} percentile
  * **Overweight** – BMI between >85^{th} and 95^{th} percentile
  * **Obese** – BMI > 95^{th} percentile
  * **Severe Obesity** – BMI > 120% of the 95^{th} percentile or BMI > 35 kg/m^2 (whichever is lower)
* Overweight is defined as having excess body weight for a particular height from fat, muscle, bone, water, or a combination of these factors.

* Obesity is defined as having excess body fat.

* Overweight and obesity are the result of “caloric imbalance”—too few calories expended for the amount of calories consumed—and are affected by various genetic, behavioral, and environmental factors.
* 10 year old girl
  --weight -100lbs

--height -55 inches

\[
\frac{100\text{lb}}{55\text{in}} \times 703 = 55\text{inches}
\]

23.2 BMI

23.2 is 95% for 10yr girl
Diagnosing Pediatric Obesity
& Initial Work-Up

* History and Physical
  * Dietary and activity history
  * Family history
  * Psychosocial history
  * Physical exam with evaluation for comorbidities.

* Lab tests:
  * HbA1c or Fasting Glucose
  * Lipid profile
  * Metabolic Panel
  * Liver Function
Interpreting Lab Results

* Prediabetes
  * Fasting Blood Glucose: 100-126mg/dL
  * Impaired glucose tolerance: 2hr BS 140-200
  * Hgb a1c 5.7-6.4

Diabetes
* Fasting blood glucose >126 is diabetes
* 2 Hr GTT >200
* Hgb a1c >6.4
Comorbidities and Complications of Childhood Obesity
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- **Endocrine Complications**
  - Prediabetes and Type 2 Diabetes
  - Metabolic Syndrome
  - Hyperandrogenism
The Growing Epidemic of Obesity and Diabetes

Growing Problem | Obesity is considered the principal precursor to type 2 diabetes in adolescents

Prevalence of obesity among children and adolescents in the U.S. for selected years

<table>
<thead>
<tr>
<th>AGES</th>
<th>1963-'70</th>
<th>'71-'74</th>
<th>'76-'80</th>
<th>'88-'94</th>
<th>'99-2000</th>
<th>'01-'02</th>
<th>'03-'04</th>
<th>'05-'06</th>
<th>'07-'08</th>
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<tbody>
<tr>
<td>2 to 5</td>
<td>4%</td>
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<td>6 to 11</td>
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<td>12 to 19</td>
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Percentage of new cases of diabetes among people ages 10 to 19 that are type 2, 2002-2005

- Overall: 34%
- American Indian: 86%
- Asian/Pacific Islander: 70%
- Black: 58%
- Hispanic: 46%
- White: 15%

Note: Obesity defined as body mass index greater than or equal to sex- and age-specific 95th percentile from the 2000 CDC Growth Charts

Sources: U.S. Centers for Disease Control and Prevention; National Institute for Diabetes and Digestive and Kidney Diseases

The Wall Street Journal
Natural History of Obesity Leading to Type 2 Diabetes

Genetic susceptibility
Environmental factors
Nutrition
Physical inactivity

Onset of diabetes
Complications
Disability
Death

Obesity
Insulin resistance
IGT
Ongoing hyperglycemia

Risk for Disease
Metabolic Syndrome
Atherosclerosis
Hyperglycemia
Hypertension
Retinopathy
Nephropathy
Neuropathy
Blindness
Renal failure
CHD
Amputation
Physical Characteristics of Children with Type 2 Diabetes at Presentation

- Acanthosis
- BMI
- Hypertension
- Family Hx

Percent Patients

- Type 2
- Type 1
Acanthosis Nigricans/Neck
Acanthosis Nigricans/Neck, Axilla
Presentation of Type 2 Diabetes in Children

- Serendipidous Finding
  - Routine labs of School
  - Evaluation of UTI
- Screening due to Obesity or Family History of Type 2 DM
- Polydipsia/polyuria/weight loss
- Decompensation during stress
- Diabetic Ketoacidosis!!!
Treatment of Type 2 DM

* Diet and weight loss
* Metformin
* Oral hypoglycemics?
* Insulin-if found in DKA
Polycystic Ovary Syndrome

Approximately 70% of teens with PCOS are obese.

- Adolescent girls typically are hyperandrogenemnic with acne, hirsutism and oligomenorrhea
- Polycystic ovaries DO NOT need to be demonstrated for the diagnosis.
- No laboratory finding (i.e. increased LH/FSH, increased testosterone, etc.) is diagnostic in all cases.
- Elevated insulin drives androgen production by the ovary.
Comorbidities and Complications of Childhood Obesity

- Cardiovascular Complications:
  - Hypertension
  - Hyperlipidemia
  - Adult Coronary Heart Disease
Comorbidities and Complications of Childhood Obesity

* **Gastrointestinal Complications**
  * Nonalcoholic Fatty Liver Disease → Cirrhosis and Liver Failure in adulthood
  * Cholelithiasis “Gallstones” - 4.2x more likely in obese girls

Approximately 50% of severely obese children have increased LFT’s with severe cases → fibrosis and cirrhosis!
Comorbidities and Complications of Childhood Obesity

- **Pulmonary Complications:**
  - Increased exercise intolerance
  - Asthma
  - Obstructive Sleep Apnea →
    - occurs in 1/3 of severe obese children
    - ✓ Shortened sleep duration
    - ✓ Decreased insulin sensitivity (increasing risk Diabetes)
    - ✓ Hypertension
Comorbidities and Complications of Childhood Obesity

* Orthopedic Complications:
  * Slipped Capital Femoral Epiphysis (SCFE) → risk of avascular necrosis, degenerative hip disease, chronic pain.
  * Tibia Vara “Bowed Legs” (aka Blount’s Disease) → knee pain and instability
  * Fractures – due to reduced bone mass
Comorbidities and Complications of Childhood Obesity

* Psychosocial Consequences!
  * Bullying!!! – targets of discrimination from peers
  * Anxiety
  * Depression
  * Poor body image and self esteem

**Childhood Obesity**
is the #1 reason for bullying

**ONE in THREE**
of America's children are overweight or obese
“...pediatricians are strongly encouraged to incorporate assessment and anticipatory guidance about diet, weight and physical activity... discuss habits rather than focusing on habitus...”

How to manage this issue in the primary care setting:

- Routine evaluation – early intervention for obesity-related risk factors
- Education to children and families
- Family-centered communication and interventions
  It’s NOT just a problem with the child!
- Emphasizing long-term changes in behaviors
  Dieting vs. Lifestyle Changes!
Age 1 to 3 Years Is a Critical Time for Developing Obesity, Study Shows

- Significant increases in prevalence both between the ages of 1 and 2 years and between ages 2 and 3 years.

- Very early childhood would be the time to focus on obesity prevention and intervention—before you see a large spike in prevalence.

- This is the time when they develop and establish food preferences and eating behaviors.
Toddler Years

* If talking about prevention these are most important years to make an impact that you don’t have to backtrack with regret.
* Avoid using food as a reward or comfort
* No “Clean Plate Club”
* No TV under 2yrs of age
* Encourage daily activity
Intervention: Do’s and Don’ts

* **Do’s**: Behavior strategies proven to work
  * Self-Monitoring
  * Stimulus Control
  * Goal Setting and Reward
  * Positive Reinforcement

* **Don’ts**: Techniques that don’t work!
  * Diet alone “crash diets”
  * Criticizing
  * Comparing to siblings or peers
  * Medications
Getting Everyone Involved is the First Step!

Home Environment is MAJOR Contributing Factor!

* Family Involvement:
  * Family-based behavioral approaches
  * Collaborative behavioral change – involving the child directly in the decision-making process. Have your child help with the grocery shopping and cooking.
  * Makes everybody invested in the process!
Change Eating Behaviors

- Sit down for as many meals as possible as a family and serve the food from the kitchen.
- Take plenty of time to finish a meal.
- Don’t eat in front of the TV, Computer, etc.
- Don’t eat at the refrigerator or kitchen cabinets.
- Schedule healthy very low calorie snack-fruit vegetable slices, popcorn.
- Keep deserts for the weekends
Increase Physical Activity

* Activities must be fun or compliance will be low.
* Walk to the store. Park further away from the mall.
* Go for a bike ride or family stroll, take the dog out.
* Take stairs, not elevators.
* Limit sedentary activities (i.e. TV, video games, etc.)
Conclusions

Childhood obesity is a serious problem with genetic roots enriched by environmental influences.

Treatment needs to be family centered and focus on behavioral changes in addition to diet and exercise.

Physicians and families need to lobby for better support for prevention and treatment of obesity in the schools, in the healthcare system, and in society.
Message to our Children

“We all need to eat right
And be active
So we can be healthy”
## Tips: Dietary Counseling in Children

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Possible solutions</th>
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| Family has little or no structure to dietary patterns (few family meals, meals are not eaten at the table, television on during meals, etc...) | Encourage family to eat meals together.  
Emphasize scheduling of meals and snacks.  
Avoid skipping meals.  
Limit meal-time distractions (eg, television). |
| Child is motivated by sports and activity, but has little interest in making dietary changes | Emphasize physical activity as primary goal; frame dietary recommendations as tools to be stronger and improve athletic performance.  
Discuss energy in versus energy out; emphasize the importance of achieving proper balance between nutrition and activity. |
| Family frequently eats meals away from home                     | Identify barriers that prevent families from eating at home more often.  
Provide meal-planning resources, initially using recipes that are familiar to them; begin the process of cooking more at home using these recipes.  
Assess the type of restaurant, usual selections, and discuss alternatives. |
| Large portion sizes                                              | Emphasize structured (pre-planned and timed) meals and snacks.  
Provide tools and education to help child learn to pay attention to bodily cues for hunger and fullness. |
| Fast eating pace                                                 | Emphasize that eating slowly is important in recognizing fullness.  
Provide family with strategies to slow down eating pace.  
Discuss “mindful eating” and encourage all family members to practice slow, mindful eating. |
| Poor dietary quality (lack of fruits/vegetables and whole grains, consumption of whole milk, etc...) | Provide education about food groups, discussing the importance of each food group as part of the daily diet.  
One approach is to discuss the concept of a “balanced plate,” focusing on supplying ample vegetables, fruits and fiber (approximately 1/4 plate each for vegetables, grains, fruits, and protein). Guidance available at [www.choosemyplate.gov](http://www.choosemyplate.gov) |
| Lacks nutritional knowledge (no label reading, does not make shopping list, etc...) | Assess family’s level of nutritional knowledge, and start by helping them set small goals, such as balancing their plates or providing a variety of foods.  
When the family is ready, increase goals gradually by discussing which foods should be eaten most often, which foods should be eaten sparingly, and teaching the family how to read food labels. |
## Tips: Dietary Counseling in Children

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<th>Issue</th>
<th>Strategy</th>
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<td>Excessive refined grains (white bread) and simple carbohydrates (sugars)</td>
<td>Emphasize the importance of including fiber in the diet as a means of decreasing hunger and feeling full after eating. Explain that whole grains are digested and absorbed at a slower rate than refined grains and sugars, resulting in a more stable blood sugar which reduces hunger and is healthier.</td>
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<tr>
<td>High-fat dairy intake</td>
<td>Compare nutritional information in high fat dairy products to low fat dairy products. Discuss types of fat: which fats are healthier, and which fats should be avoided (ie, trans fats and saturated fats).</td>
</tr>
<tr>
<td>Skipping meals</td>
<td>Emphasize the importance of eating three regularly-scheduled meals a day to have a healthy weight and metabolism. Explain that meal-skipping can lead to increased hunger and excessive eating later. Start by establishing a small goal to eat just one food group at the time that they would usually skip a meal. Increase goal gradually by introducing other food groups as the child is ready; encouraging them to achieve a balanced meal.</td>
</tr>
<tr>
<td>Excessive snacking</td>
<td>Set a snack schedule between meals to encourage less grazing. Outline several choices for healthy snacks. Emphasize the importance of eating a single portion of food from two different food groups to encourage fullness until the next meal.</td>
</tr>
<tr>
<td>High intake of sugar-sweetened beverages</td>
<td>Discuss empty calories from sugar-containing beverages (which include 100 percent fruit juices). Estimate the number of calories that the child is currently taking from beverages. Suggest low-sugar alternatives for family to try.</td>
</tr>
<tr>
<td>Low fruit and vegetable intake</td>
<td>Provide education regarding serving sizes of vegetables and fruits. Discuss the importance of fiber from vegetables and fruits. Have the family try new vegetables and fruits to increase variety. Provide quick and easy recipes or products.</td>
</tr>
<tr>
<td>Picky eating</td>
<td>Introduce child to new foods gradually. Provide the same foods for each family member; no “special orders.” Eat meals and snacks together as a family. Structure meals and snacks. Encourage, but do not pressure child to eat a specific food. Continue to offer the same food on multiple occasions.</td>
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Before birth: eat healthy in your pregnancy

After birth: breast is best, but there’s always formula; clean your baby’s teeth daily.

From birth to age 6months: Exclusive breastfeeding is recommended (or formula)
- in reality your baby can survive on only breast or bottle for first year of life.
- your baby’s liver is not ready for any fructose until 6months

From 6months-12months: continue breast or formula as the main source of calories
- no juice is needed
- water in a sippy cup or bottle if needs bottle to go to bed
- at 6mo feed solids once a day, 7mo twice a day, 8mo 3 times a day
- only one new food every 3 to 5 days-to monitor for any food allergy
- only two foods to avoid until 1 yr of life: whole milk and honey
- if you feel your baby is getting constipated, first try stage 2 prunes daily
Those that choose to give juice: should be only 4-6oz a day, and preferably orange juice for calcium/Vit C

- From 1 to 2 yrs of age-choose whole milk (18-24oz/day) or water
- After age 2 may use any reduced fat milk (18-24oz/day) and water
- Foods: Encourage your family to eat whole foods, eat the food as close to the way it was grown as possible.
- Boil, broil, steam, or BBQ. Shop the perimeter of the grocery store.
- Avoid: deserts, juices, sweets, dipping sauces, fast foods
- As a parent we must be an example to our children, we want them to look up to us.
- Eat as a family and eat at the table, not in front of the TV.