Obesity in Pregnancy

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Marian Regional Medical Center
CDAPP Webinar, December 10, 2014

Objectives

- Review the pertinent definitions and guidelines related to obesity in pregnancy
- Identify risks of obesity in pregnancy
- Discuss management strategies at different stages

Outline

- Background
  - Definition and Classification
  - Epidemiology and Incidence
  - Pathophysiology
- Pregnancy Complications
  - Maternal
  - Fetal
  - Intrapartum
- Management
  - Preconception care
  - Prenatal Care
  - Intrapartum Care
- Special population: Bariatric surgery
Disclaimer

- This webinar is considered a resource, but does not define the standard of care in California. Attendees are advised to adapt the guidelines and resources based on their local facility's level of care and patient populations served and are also advised to not rely solely on the guidelines presented here.

Background

- Definitions
- Prevalence
- Basic pathophysiology

Body Mass Index (BMI)

http://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm

\[
\text{BMI} = \frac{\text{mass (Kg)}}{\text{height (m}^2\text{)}}
\]
+ Definition, WHO

Classification of adults according to BMI

<table>
<thead>
<tr>
<th>Classification</th>
<th>BMI</th>
<th>Risk of complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.50</td>
<td>Low (but risk of other clinical problems increased)</td>
</tr>
<tr>
<td>Normal range</td>
<td>18.50–24.99</td>
<td>Average</td>
</tr>
<tr>
<td>Overweight</td>
<td>≥25.00</td>
<td>Increased</td>
</tr>
<tr>
<td>Obese class I</td>
<td>30.00–34.99</td>
<td>Moderate</td>
</tr>
<tr>
<td>Obese class II</td>
<td>35.00–39.99</td>
<td>Severe</td>
</tr>
<tr>
<td>Obese class III</td>
<td>≥40.00</td>
<td>Very severe</td>
</tr>
</tbody>
</table>


Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2011

*Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

![Map showing prevalence of obesity by state and territory]

Behavior Risk Factor Surveillance System, CDC 2011

Prevalence* of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2012

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![Map showing prevalence of obesity by state and territory]

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<table>
<thead>
<tr>
<th>State</th>
<th>Prevalence</th>
<th>Behavior Risk Factor Surveillance System, CDC 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA</td>
<td>15%–20%</td>
<td></td>
</tr>
<tr>
<td>MT</td>
<td>20%–25%</td>
<td></td>
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<tr>
<td>ID</td>
<td>25%–30%</td>
<td></td>
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<tr>
<td>NV</td>
<td>30%–35%</td>
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<tr>
<td>UT</td>
<td>≥35%</td>
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<tr>
<td>AZ</td>
<td>15%–20%</td>
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<tr>
<td>NM</td>
<td>20%–25%</td>
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<tr>
<td>WY</td>
<td>25%–30%</td>
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<tr>
<td>WA</td>
<td>30%–35%</td>
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<tr>
<td>OR</td>
<td>≥35%</td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>15%–20%</td>
<td></td>
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<tr>
<td>NE</td>
<td>20%–25%</td>
<td></td>
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<tr>
<td>ND</td>
<td>25%–30%</td>
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<tr>
<td>SD</td>
<td>30%–35%</td>
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<tr>
<td>TX</td>
<td>≥35%</td>
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<tr>
<td>OK</td>
<td>15%–20%</td>
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<tr>
<td>KS</td>
<td>20%–25%</td>
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<td>IA</td>
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<td>MN</td>
<td>30%–35%</td>
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<tr>
<td>AR</td>
<td>≥35%</td>
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<tr>
<td>MO</td>
<td>15%–20%</td>
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<td>LA</td>
<td>20%–25%</td>
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<tr>
<td>MI</td>
<td>25%–30%</td>
<td></td>
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<tr>
<td>IN</td>
<td>30%–35%</td>
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<tr>
<td>KY</td>
<td>≥35%</td>
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<tr>
<td>IL</td>
<td>15%–20%</td>
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<td>OH</td>
<td>20%–25%</td>
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<td>TN</td>
<td>25%–30%</td>
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<td>MS</td>
<td>30%–35%</td>
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<tr>
<td>AL</td>
<td>≥35%</td>
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<td>WI</td>
<td>15%–20%</td>
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<td>PA</td>
<td>20%–25%</td>
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<td>WV</td>
<td>25%–30%</td>
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<tr>
<td>SC</td>
<td>30%–35%</td>
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<tr>
<td>VA</td>
<td>≥35%</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>15%–20%</td>
<td></td>
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<tr>
<td>GA</td>
<td>20%–25%</td>
<td></td>
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<tr>
<td>FL</td>
<td>25%–30%</td>
<td></td>
</tr>
<tr>
<td>NY</td>
<td>30%–35%</td>
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<tr>
<td>VT</td>
<td>≥35%</td>
<td></td>
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<tr>
<td>ME</td>
<td>15%–20%</td>
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<tr>
<td>HI</td>
<td>20%–25%</td>
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<tr>
<td>AK</td>
<td>25%–30%</td>
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<tr>
<td>NH</td>
<td>30%–35%</td>
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<tr>
<td>MA</td>
<td>≥35%</td>
<td></td>
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<tr>
<td>RI</td>
<td>15%–20%</td>
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<tr>
<td>CT</td>
<td>20%–25%</td>
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<tr>
<td>NJ</td>
<td>25%–30%</td>
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<tr>
<td>DE</td>
<td>30%–35%</td>
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<tr>
<td>MD</td>
<td>≥35%</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>15%–20%</td>
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<tr>
<td>PR</td>
<td>20%–25%</td>
<td></td>
</tr>
<tr>
<td>GU</td>
<td>25%–30%</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>30%–35%</td>
<td></td>
</tr>
</tbody>
</table>

+ Prevalence

- 1/3 women are obese
- More than 1/2 pregnant women are overweight or obese
- 8% of reproductive-age women are extremely obese
- Differences among ethnic groups
  - Non-hispanic black women 50%
  - Mexican-American women 45%
  - Non-Hispanic white women 33%

Flegal, JAMA 2012 (NHANES)
ACOG: Obesity in Pregnancy CO 2013

+ Basic Pathophysiology

- Adipose \( \rightarrow \) hypoxia \( \rightarrow \) chronic inflammation
- Produce Adipokines
  - Eg Leptin
- Epigenetic modifications
  - Early embryo metabolism
- Effects on pregnancy
  - Birth defects
  - Fetal growth aberrations
  - Insulin resistance

Bergheult MF Evidence Based Guidelines 2012
Creasy and Resnik 2014
Associated Complications

Maternal
Fetal
Intrapartum

Independent risk factor vs. association with diabetes

- Pregnancy complications similar in diabetes and obesity
- Multi-center, prospective study
- Obese, glucose-tolerant women
- Increased complications
  - Fetal: macrosomia, NICU admission, shoulder dystocia, congenital anomalies
  - Maternal: cesarean delivery, emergent cesarean, hypertensive disorders

Owens, Diabetes Care 2010

Pregnancy Complications: Maternal

- Miscarriage
- Gestational and pre-gestational diabetes (later slide)
- Pregnancy-associated hypertension
- Indicated and spontaneous preterm birth
- Post-term pregnancy
- Multifetal pregnancy
- UTI
Pregnancy Complications: Maternal
- Obstructive sleep apnea
- Arrest of labor
- Failed trial of labor after cesarean
- Cesarean delivery
- Anesthesia complications
- Shoulder dystocia
- Postpartum complications (infection and hemorrhage)
- Decreased breastfeeding
- Venous thromboembolic events

Pregnancy Complications: Maternal
- Large, prospective multicenter trial, 16,102 patients
- Morbidity increases: obesity (BMI 30-34.9) and morbid obesity (BMI 35 or greater)
  - Gestational diabetes: OR 2.6 and 4.0
  - Gestational hypertension: OR 2.5 and 3.2
  - Preeclampsia: OR 1.8 and 3.3
  - Fetal birth weight greater than 4000 gm: OR 1.7 and 1.8
  - Fetal birth weight greater than 4500 gm: OR 2.0 and 2.4
- Cesarean delivery rates for nulliparous patients:
  - BMI <30: 20.7%
  - Obese: 33.8%
  - Morbidly obese: 47.4%

*OR=Odds ratio Weiss AJOG 2004

<table>
<thead>
<tr>
<th>Maternal Morbidity</th>
<th>Adjusted OR</th>
<th>95% CI</th>
<th>Adjusted OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthesia</td>
<td>2.09</td>
<td>1.18-3.69</td>
<td>2.89</td>
<td>1.84-4.56</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.96</td>
<td>1.19-7.38</td>
<td>3.05</td>
<td>1.17-7.91</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2.13</td>
<td>1.22-3.71</td>
<td>2.09</td>
<td>1.20-3.64</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>2.54</td>
<td>1.56-4.14</td>
<td>2.41</td>
<td>1.50-3.87</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>1.63</td>
<td>1.24-2.14</td>
<td>1.61</td>
<td>1.23-2.13</td>
</tr>
<tr>
<td>Delivery complications</td>
<td>3.09</td>
<td>1.57-6.05</td>
<td>2.90</td>
<td>1.50-5.63</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
<td>4.36</td>
<td>1.65-11.42</td>
<td>4.27</td>
<td>1.53-11.89</td>
</tr>
<tr>
<td>Postpartum infection</td>
<td>2.36</td>
<td>1.23-4.52</td>
<td>2.35</td>
<td>1.22-4.51</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>1.25</td>
<td>1.02-1.53</td>
<td>1.24</td>
<td>1.02-1.53</td>
</tr>
<tr>
<td>Cesarean delivery</td>
<td>2.01</td>
<td>1.33-3.04</td>
<td>2.00</td>
<td>1.33-3.04</td>
</tr>
</tbody>
</table>

OR, odds ratio; BMI, body mass index; OR* = Odds ratio Weiss AJOG 2004

Robinson: Obstetrics and Gynecology 2005
Gestational and type 2 diabetes

- Consistent evidence
- Prevalence GDM increases by 0.92% for every 1 kg/m² BMI
- Impaired carbohydrate tolerance
- Type 2 diabetes: one of most common morbidities of obese gravida
- Indication for first trimester screening
- Risk factors for GDM
  - Weight gain between pregnancies
  - Weight gain between age 18 and pregnancy
  - Excessive weight gain associated with impaired glucose tolerance

Torlini, Obesity Reviews, 2009
Creasy and Resnik 2014

Institute of Medicine 2009

<table>
<thead>
<tr>
<th>Prepregnancy Weight</th>
<th>Body Mass Index</th>
<th>Recommended Range of Total Weight (lbs)</th>
<th>Recommended Rate of Weight Gain in the Second and Third Trimesters (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 18.5</td>
<td></td>
<td>28-40</td>
<td>1 (0.5-1.5)</td>
</tr>
<tr>
<td>Normal Weight</td>
<td>18.5-24.9</td>
<td>25-35</td>
<td>1 (0.5-1.5)</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29.0</td>
<td>15-25</td>
<td>0.5 (0.5-0.7)</td>
</tr>
<tr>
<td>Obesity (includes all classes)</td>
<td>30 and greater</td>
<td>11-20</td>
<td>0.5 (0.5-0.7)</td>
</tr>
</tbody>
</table>

Body mass index is calculated as weight in kilograms divided by height in meters squared or as weight in pounds multiplied by 703 divided by height in inches squared.

Citations assume 0-1.4 lbs of weight gain in the first trimester.


Pregnancy Complications: Fetal

- Prematurity
- Stillbirth
- Congenital anomalies
- Macrosomia
- Childhood and adolescent obesity

ACOG: Obesity in Pregnancy CO 2013
Fetal Anomalies

- Absolute risk increased
  - Neural tube defect OR 1.87; Cardiovascular OR 1.3; cleft lip/palate OR 1.2; hydrocephaly OR 1.68; limb reduction 1.34 (nb gastroschisis risk decreased OR 0.17)

- Ultrasound detection rates decreased:
  - Normal BMI: 66%
  - Overweight: 49%
  - Obesity Class I: 48%
  - Obesity Class II: 42%
  - Obesity Class III: 25%

- **Women with pregestational diabetes, targeted scan, equivalent BMI**
  - Detection 38% vs 88%

Stothard, JAMA, 2009
Dashe, Obstetrics and Gynecology, 2009

HAPO Study

- Hyperglycemia and Adverse Pregnancy Outcomes
- Observational cohort
- 15 centers, 9 countries, 23,316 participants
- 75 gm 2 hr OGTT, blinded
- Primary outcomes: birthweight >90th; neonatal hypoglycemia, fetal hyperinsulinemia, primary cesarean delivery
- Higher maternal BMI: strongly associated with pregnancy complications

HAPO study cooperative research group, BJOG 2010

Fetal Overgrowth-HAPO study

- Hypothesis: Obesity before conception \(\rightarrow\) independent risk for fetal overgrowth
- Secondary study of HAPO working group
- Independent and additive effect of maternal obesity and GDM

Catalano, Diabetes Care 2012
Fetal Overgrowth-HAPO study

| BMI | Glucose
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.00</td>
</tr>
<tr>
<td>Obese</td>
<td>2.00</td>
</tr>
</tbody>
</table>

Increased risk of metabolic syndrome about 2x

In GDM mothers

Risk of metabolic syndrome 3.5x higher if LGA vs AGA

Maternal pre-gravid BMI (independent of birth weight or GDM)

Strongest predictor of childhood obesity

Childhood and Adolescent Obesity

- Children LGA at birth and obese mothers
  - Increased risk of metabolic syndrome about 2x
- In GDM mothers
  - Risk of metabolic syndrome 3.5x higher if LGA vs AGA
- Maternal pre-gravid BMI (independent of birth weight or GDM)
  - Strongest predictor of childhood obesity

Intra-partum complications

- Anesthesia
  - Epidural/spinal: obscured landmarks, adipose, positioning
  - Intubation: difficult airway, intra-operative respiratory events
- Cesarean delivery
  - Operative complications: blood loss, operative times
  - Postoperative: wound infection, endometritis, thromboembolism
- Estimation of fetal weight
- Inability to obtain interpretable FHR and contraction monitoring

ACOG: Obesity in Pregnancy CO 2013
Preconception care and counseling

- Calculate and record BMI
- Review history and comorbidities
- Counseling of pregnancy complications
- Glucose screen
- Counsel and plan for weight loss (see next slide)
  - Nutrition counseling
  - Exercise counseling
- Baseline health evaluation
  - 24 hour urine, transaminases, CBC
  - For BMI >35, Echo, EKG, Sleep apnea evaluation

Preconception care and counseling: Weight loss readiness

1. **Precontemplation**
   - Unaware of the problem, no interest in change
   - Provide information on health risks
2. **Contemplation**
   - Aware of the problem, beginning to think of changing
   - Discuss barriers
3. **Preparation**
   - Realize benefits of making change and thinking of how
   - Teach behavior modification, provide specific methods
4. **Action**
   - Actively taking steps toward change
   - Provide support and guidance, encouragement, trouble-shooting
5. **Maintenance**
   - Initial treatment goals reached
   - Relapse control, tools to help stay on track

ACOG: Motivational Interviewing, CO 2009
Preconception Workup

- Overweight, Class I, Class II, Class III
  - If motivated, start diet and exercise plan
  - Successful → support for weight loss plan
  - Not successful → consider drug therapy
  - If not motivated, periodic weight assessment

- Class II with comorbidities and Class III
  - Consider bariatric surgery referral

Prenatal Care:

- Initial visit:
  - BMI calculation
  - Review IOM recommendations for appropriate weight gain
  - Reiterate throughout pregnancy
  - Nutrition counseling → offer to all obese women
  - Exercise program
  - Labor
    - Early anesthetic consultation
  - Cesarean delivery:
    - Thromboprophylaxis, consider medical ppx
    - Increased dose prophylactic antibiotics preoperatively
    - Suture closure of subcutaneous layer

Prenatal Care:

- Nutritional supplementation (for BMI ≥ 30)
  - Folate 5 mg daily
  - Vitamin D 10 mcg daily
- Anesthesia: antenatal consultation for BMI ≥ 40
- 3rd trimester assessment of equipment and resources
  - OR Bed capacity, transfer equipment, large SCDs
- Active management 3rd stage of labor for BMI ≥ 30
- Postnatal thromboprophylaxis x1 week for BMI ≥ 40

ACOG: Obesity in Pregnancy CO 2013
CMACE/RCOG Joint Guideline 2010
Special Population: Patients with a history of gastric bypass

Types of Procedures

- Roux-en-Y Gastric Bypass: restrictive and malabsorptive
- Gastric Banding: restrictive

Bariatric Surgery: Considerations

- Most effective form of weight loss for morbid obesity
- Prevalent in pregnant population
  - 80% of procedures are in females
  - 50% of all procedures in reproductive-aged women
- Rapid weight loss → improved fertility
- Obesity persists in as many as 80% of pregnant patients with a history of bariatric surgery
- General: complication rates higher than general population but lower than in obese patients
- Independent risk factor for cesarean delivery

ACOG: Bariatric Surgery and Pregnancy FS 2009
### Bariatric Surgery: Considerations

- Decreased maternal complication rates
  - Pre-gestational diabetes
  - Preeclampsia
  - Decreased maternal weight gain
- Fetal complication rates
  - Congenital anomaly rates similar to general population
  - Decreased rate of fetal overgrowth

### Bariatric Surgery: Management Issues

#### Nutritional considerations
- Evaluate for micronutrient deficiencies every trimester
- CBC, Iron, Calcium, vitamin D, folate
- Supplementation, addition to a multivitamin
- May require “active band management” → banding lessened

#### Bariatric-related operative complications
- Anastomotic leaks, bowel obstruction, band migration
- ALL GI complaints require thorough evaluation

### Dumping syndrome
- Cramping, bloating, vomiting, diarrhea
- Subsequent hyperinsulinemia → hypoglycemia
- May not tolerate 50 gm glucose load for GDM screening
  - Alternative: home glucose monitoring x 1 week fasting an post-prandial
Conclusions

- WHO describes obesity as “one of the most blatantly visible, yet neglected, public health problems that threatens to overwhelm both more and less developed countries”
- Reproductive age women significantly affected
- Independent risk factor for maternal and fetal complications
- Special care and must be taken to address issues at all stages
- Controlling pre-pregnancy and gestational weight gain can help in controlling epidemic
- Global responsibility to not “neglect” this epidemic

References

References