# Bariatric Surgery and Pregnancy Care: Prenatal and Postnatal Considerations

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1

## Disclosures:

I have nothing to disclose

2

2

# Objectives

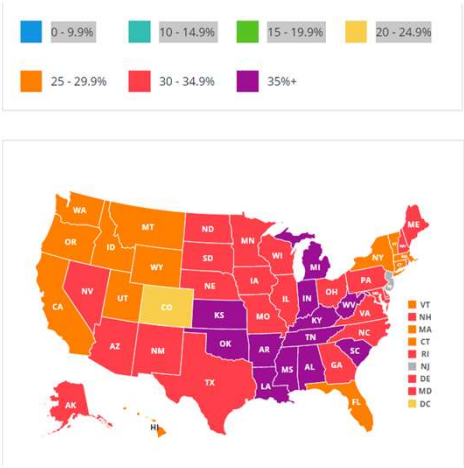
1. Review bariatric surgery as treatment for obesity in women
2. Discuss nutritional considerations after bariatric surgery
3. Review nutrition needs and potential nutrient deficiencies that may impact pregnancy care
4. Discuss nutrition counseling in the pre- and postnatal periods



3

# Adult Obesity Rates by State, 2019

http://stateofobesity.org/adult-obesity




4

# Multiple Factors Influencing Obesity


5

# Types of Bariatric Surgery

**Malabsorptive and Restrictive**

- Roux-En-Y Gastric Bypass
- SIPS
- BPD/DS (Biliopancreatic diversion/duodenal switch)

**Restrictive**

- Sleeve Gastrectomy
- Intragastric Balloon
- LAGB (laparoscopic adjustable gastric band)

**To qualify for bariatric surgery:**

- **BMI >/=35 + 1 co-morbid condition**
- **BMI >/=40 without any co-morbid conditions**

6

# ASMBS SURGICAL ESTIMATIONS

## Estimate of Bariatric Surgery Numbers, 2011-2019

Published March 2021

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019* |
|---|---|---|---|---|---|---|---|---|---|
| **Total** | **158,000** | **173,000** | **179,000** | **193,000** | **196,000** | **216,000** | **228,000** | **252,000** | **256,000** |
| **Sleeve** | 17.8% | 33.0% | 42.1% | 51.7% | 53.6% | 58.1% | 59.4% | 61.4% | 59.4% |
| **RYGB** | 36.7% | 37.5% | 34.2% | 26.8% | 23.0% | 18.7% | 17.8% | 17.0% | 17.8% |
| **Band** | 35.4% | 20.2% | 14.0% | 9.5% | 5.7% | 3.4% | 2.7% | 1.1% | 0.9% |
| **BPD-DS** | 0.9% | 1.0% | 1.0% | 0.4% | 0.6% | 0.6% | 0.7% | 0.8% | 0.9% |
| **Revision** | 6.0% | 6.0% | 6.0% | 11.5% | 13.6% | 14.0% | 14.1% | 15.4% | 16.7% |
| **Other** | 3.2% | 2.3% | 2.7% | 0.1% | 3.2% | 2.6% | 2.5% | 2.3% | 2.4% |
| **Balloons** | – | – | – | – | 0.3% | 2.6% | 2.8% | 2.0% | 1.8% |

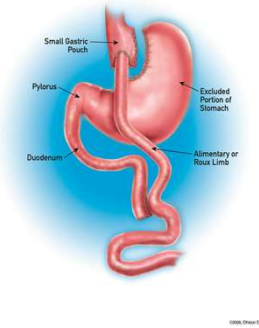
The ASMBS total bariatric procedure numbers are based on the best estimation from available data (BOLD,ACS/MBSAQIP, National Inpatient Sample Data and outpatient estimations).

**New methodology for estimating outpatient procedures done at non-accredited centers.*

**Less than 1% of eligible individuals get surgery**

7

# Roux-En-Y Gastric Bypass




- 150 cm Roux Limb → increases malabsorption and increases weight loss
- Duodenum is 70 cm
- Common Channel: >250 cm for absorption of nutrients
- Average weight loss: 60-70% of excess BW in 1-1.5 years
- At 10 years, most patients regain 10-15% of BW (old habits die hard!)
- At risk to malabsorb: Ca, Fe, B12, D, folate, thiamine

8

# Risks Associated with Gastric Bypass

Short-Term

- Leak at staple line or bowel connection
  - Abdominal infection or abscess
- Blood clot in leg veins
- Pulmonary embolus
- Wound problems (infection, hernia, scar)
- Nausea/vomiting
- Injury to the spleen, stomach, esophagus
- Pneumonia
- Risk for death (30 day mortality): 0.1-0.4%

Long-Term

- Internal hernia
- Bowel obstruction/blockage
- Narrowing (stricture) of intestinal connections
- Flatulence/gas
- Diarrhea/constipation
- Dumping syndrome
- Failure to lose weight/weight regain
- Vitamin/protein deficiencies/malnutrition
- Gallstones
- Ulcers

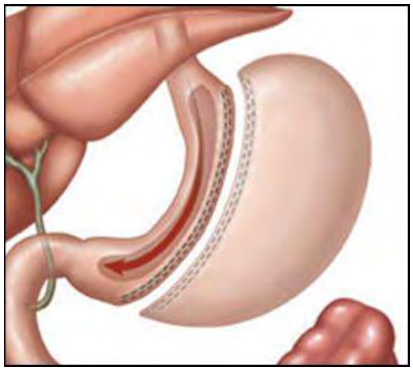
9

# Benefits of Gastric Bypass

- Diabetes: 90% become diet controlled
  - Most patients leave the hospital on **NO** medicines
- High blood pressure: 66% resolved; 33% less medications
- Reflux/Heartburn: 95% resolved
- Sleep apnea: 90 % resolved
- Stress Incontinence: 90% resolved
- High cholesterol/triglyceride: 90% resolved

10

# Sleeve Gastrectomy



- Newer procedure created for a two-step procedure
- Restrictive effect from the stomach
- Removes ~80-85% of the stomach – NON-reversible
- NO malabsorption
- Big benefit → reduced ghrelin production, so patients do not feel hungry
- Average weight loss: 50% of excess BW in 1-1.5 years
- Nutrients of concern: B12, iron, thiamine, calcium

11

# Risks of Sleeve Gastrectomy

- Leak
- Post-op bleeding
- Nausea/vomiting
- Blood clot in leg veins
- Pulmonary embolus
- Would problems – infection, hernia, scar
- Injury to spleen, stomach, or esophagus
- Pneumonia
- Risk of death (30-day mortality rate): 0.1-0.2%

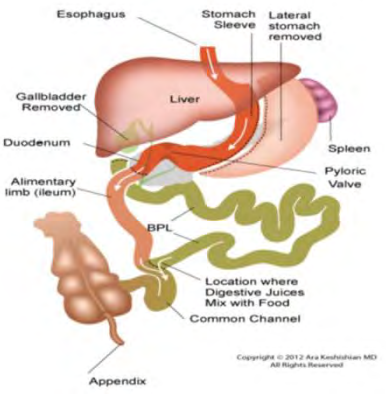
12

# Benefits of Sleeve Gastrectomy

- Early data shows good resolution of co-morbidities similar to the gastric bypass
- No intestinal bypass
  - No internal hernias
  - No dumping syndrome
  - Less vitamin deficiencies, protein malnutrition, anemia, osteoporosis
- Second stage operation available if inadequate weight loss

13

# Duodenal Switch (BPD/DS)




- Much more malabsorptive than RyGB/SIPS
- Typically for severely obese (BMI >50)
- 75% stomach removed; 75% of GI tract bypassed
- Common channel: 50-150 cm (essentially short gut)
- Malabsorb fat >70% and protein ~25%
- ADEK supplementation is crucial due to increased risk for nutrition deficiencies
- Average weight loss: 70-80% excess BW
- Considered best treatment for T2DM
- At risk to malabsorb: iron, calcium, zinc, B12, folate, ADEK, protein

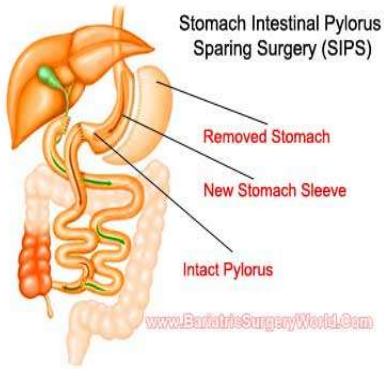
14

# Risks of BPD/DS

- Essentially short gut syndrome
- High level of malabsorption
  - Must supplement fat soluble vitamins (ADEK)
  - Carefully monitor labs
- Bacterial overgrowth

15

# SIPS (Stomach Intestinal Pylorus Sparing Surgery)




- Newer procedure to create more malabsorption → essentially a hybrid of a bypass and a sleeve
- Common channel is *300 cm*
- Less side effects than BPD/DS
- Can be used as a primary surgery or revision surgery
- Current data shows 70% EBW lost at 1 years, but still too early to tell

16

# Risks Associated with SIPS

- Leak
- Stricture
- Intussusception
- Obstruction
- Hernias
- Malabsorption
- Vitamin and Mineral deficiencies

17

# Benefits of SIPS

•~70+% of excess weight loss at 12 months

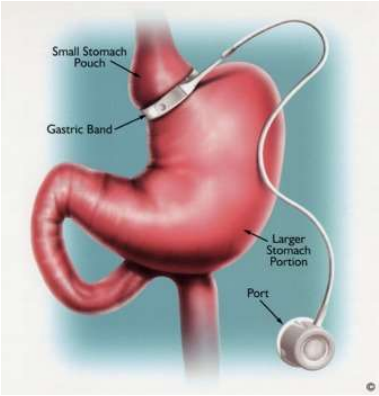
•Early weight loss data shows promising results, but too early to tell

•Nutrition monitoring and supplementation mirrors DS recommendations, but malabsorption is less

Mitzman et al, 2017

18

# LAGB (Laparoscopic Adjustable Gastric Band)




- Restricts amount of food upper stomach can hold (~1/2 cup)
- Normal absorption of nutrients
- Need frequent adjustments of the band (fill to make tighter)
- Easily reversible
- Average weight loss: 40% of excess BW
- Complications: erosion in the stomach, slip, chronic n/v
- Nutrients of concern: folate, thiamin, B12, calcium
- 1 in 5 LAGB patients undergo reoperation

Ibrahim et al, 2017

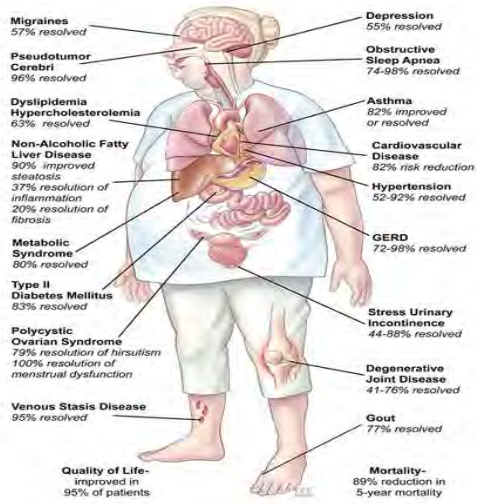
19

# Nutritional Considerations Post-Surgery

**Dependent on surgery (malabsorptive + restrictive versus restrictive)**

- Risk for protein-energy malnutrition
- Protein supplementation, fat/carbohydrate restriction is a MUST
- Adequate hydration
- Daily vitamin and mineral supplementation is also a MUST
- Ability to follow nutrition and program recommendations lifelong

20




Cleveland Clinic

Cleveland Clinic

21

# 2016 & 2019 ASMBS Guidelines

2016 guidelines provides updates on **key nutrient deficiencies and recommendations for repletion** (79 new recommendations)

2019 guidelines provides updates on **perioperative protocols - enhanced recovery after bariatric surgery (ERABS) – includes dietary recommendations after bariatric surgery**

Parrott et al, 2016
Kushner et al, 2019

22

# General Nutrition Goals Post Surgery

**0-6 Months Post-Op**

- 60-70 grams protein/day
- <90 grams of carbohydrates/day
- <850 calories/day

**12+ Months Post-Op**

- 80-120 grams protein/day
- <130 grams of carbohydrates/day
- <1300 calories/day

**For Life**

- Focus on protein at all meals and supplementation as needed
- Limiting carbohydrates, grains, junk foods, sugary foods/drinks, fast food
- Vitamins+minerals
- Hydration, hydration, hydration -64 ounces minimum!
- Regular physical activity

23

# Lab Screening Interval at NMC

- Pre-operative visit and prior to surgery
- Post-operative visits
  - 3 months
  - 6 months
  - 9 months
  - 12 months
  - 18 months
  - 24 months → yearly after that

24

# Micronutrient Deficiencies to Screen For After Surgery

- B12
- Zinc
- Copper
- Thiamine
- Folic Acid
- Iron
- Calcium
- Vitamin A, D, E, K

25

# Vitamin and Mineral Supplementation

| Vitamin | Dose Instructions | Directions |
|---|---|---|
| **Multivitamin- Mineral Supplement** | Recommend: 200% of daily value | Begin with chewable or liquid<br>Progress to tablets as tolerated<br>Choose a complete formula with: 45-60 mg elemental iron, 400-1000 ug folic acid, 12 mg thiamine, and contains selenium and zinc in each serving.<br>Avoid incomplete children's vitamins. |
| **Vitamin B-12** | 350-1,000 mcg per day | Available sublingual, liquid, mouth spray or nasal gel/spray |
| **Calcium Citrate** | 1,200-1,500 mg per day | Begin with chewable and progress to tablets as tolerated.<br>Split into 500-600 mg doses.<br>Space evenly throughout the day and take with food. |
| **Vitamin D-3** | 3000 International Units per day | Often found in gel capsules, but is now made in chewable form.<br>Often found in combination with Calcium. |

Reference source: 2019 Clinical Practice Guidelines Bariatric Surgery Patients ASMBS and AACE

26

# Screening at NMC (Yearly)

- CBC
- CMP
- Vitamin B12
- Folic Acid
- Pre-albumin
- Vitamin D 25 OH
- PTH Intact
- BPD/DS or patient's with longer limb bypass: PT/INR, Vitamin A, E, K

27

# Bariatric Surgery and Pregnancy

- Estimated that 60-80% of WLS are done on women of reproductive age (Shawe et al., 2019).
  - Infertility (PCOS, metabolic syndrome)
  - Gestational diabetes
  - Hypertensive Disorders
  - Large-for-gestational-age neonates
- Current recommendations for avoiding conception:
  - ASMBS and AACE: 12-18 months
  - ACOG: 12-24 months
  - Education should be provided for contraception
    - Ensure maximal weight loss
    - Achieve weight stabilization
    - Reduce risk of macronutrient deficiencies and electrolyte imbalances
    - Fetal outcomes

28

28

# Nutrition during Pregnancy

- Dietary intake during pregnancy
  - Dietary intake may be poor independent of WLS (Ma, et al., 2016).
  - Hyperemesis
    - Medication management
    - Need for nutrition support in extreme cases
  - Dehydration
  - Dumping syndrome (postprandial syndrome)
  - Protein needs
    - Minimum 60 grams per day
    - Protein first—fruits and veggies—other carbohydrates

29

29

# Weight Gain

**Table 1.** Institute of Medicine Weight Gain Recommendations for Pregnancy ⇦

| Prepregnancy Weight Category | Body Mass Index* | Recommended Range of Total Weight (lb) | Recommended Rates of Weight Gain† in the Second and Third Trimesters (lb) (Mean Range [lb/wk]) |
|---|---|---|---|
| Underweight | Less than 18.5 | 28–40 | 1 (1–1.3) |
| Normal Weight | 18.5–24.9 | 25–35 | 1 (0.8–1) |
| Overweight | 25–29.9 | 15–25 | 0.6 (0.5–0.7) |
| Obese (includes all classes) | 30 and greater | 11–20 | 0.5 (0.4–0.6) |

*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.

†Calculations assume a 1.1–4.4 lb weight gain in the first trimester.

Modified from Institute of Medicine (US). Weight gain during pregnancy: reexamining the guidelines. Washington, DC. National Academies Press; 2009. ©2009 National Academy of Sciences.

30

30

# Weight Gain and Surgery Type

LAGB
- Restrictive and adjustable
- Mothers typically have adequate weight gain
- No apparent impact on birth weight

SGA
- Restrictive
- Potential for SGA fetuses
- No malabsorption

RYGB
- Restrictive and malabsorptive
- Associated with increased risk of SGA fetuses
- Anatomical and neuro-hormonal changes

31

31

# Benefits/Risks

**Table 7** The differentiation between complications in pregnant women with obesity and post-bariatric surgery pregnancy

| Stages of pregnancy | Complications associated with obese pregnant | Complications associated with post-bariatric surgery pregnant |
|---|---|---|
| 1st trimester | Vomiting [55]<br>Increase risk of miscarriage [55]<br>Anemia [31] | Vitamin K deficiencies [76]<br>Vitamin D deficiency [68]<br>Vomiting [55]<br>Anemia [68] |
| 2nd trimester | Gestational diabetes mellitus [77]<br>Pregnancy-associated hypertensive disorders [78] | Vitamin B12 deficiency [68] |
| 3rd trimester | Preeclampsia [78] | Anemia [13]<br>Calcium deficiency [76]<br>Increases risk for osteoporosis [76] |
| Postpartum | Postpartum hemorrhage [7, 33]<br>Postnatal depression [55]<br>Vaginal lacerations [7]<br>Perianal lacerations [7, 33] | Thiamine deficiency [68]<br>Vitamin A deficiency [68] |

(Alamri & Abdeen, 2022)

32

32

# Post-WLS Recommendations

**Table 8** Summary of the recommendations for post-bariatric surgery pregnancy

| | Preconception | During pregnancy | Postpartum and breastfeeding |
|---|---|---|---|
| Contraception | • Reproductive health counseling pre-bariatric surgery<br>• To avoid oral contraceptives, due to decrease the drug bioavailability post-bariatric surgery<br>• To use long-acting reversible contraception (etonogestrel implants and intrauterine devices) | | |
| Surgery-to-conception interval | • Postponing pregnancy from 12 to 18 months post-surgery<br>• The dramatic weight loss occurs in the first year | | |
| Nutritional intake | • Monitor the weight prior to pregnancy<br>• In case of underweight to refer patient to clinical dietitian to correct the weight<br>• If the pregnant is obese, it is preferable to lose weight before pregnancy to avoid obesity-related complications in pregnancy | • Monitor nutrition intake during pregnancy and assess for GWG if it is inadequate or excessive<br>• To avoid excessive or inadequate gestational weight gain; appropriate gestational weight gain 11.5–16 kg for normal BMI as the IOM guidelines stated<br>• Protein intake should be at least 60 g per day<br>• Oral supplementation might be considered in case of inadequate nutrient intake or in the presence of hyperemesis gravidarum | • Ensure adequate calorie and protein during breastfeeding<br>• Avoid excessive calories to avoid weight retention after pregnancy |
| Maternal and fetal screening | | • Guidelines for pregnant women post-bariatric surgery should be considered as they are high-risk pregnancies as diabetic and hypertensive pregnancies<br>• Check fasting glucose level and hgb A1C if there is a history of diabetes<br>• Check fetal growth every 4–6 weeks of pregnancy starting from the 24th week for LGA and SGA<br>• Oral glucose tolerance test at 24–28 weeks as possible. Noted that it was associated with dumping syndrome in some cases of post-bariatric surgery pregnancy | |
| Laboratory assessment | • Serum indices to be checked every 3 months: full blood count, vitamins A, B12, iron, ferritin, transferrin, and folic acid<br>• Serum indices to be checked every 6 months: serum vitamin K1, vitamin D, protein, albumin, calcium, phosphate, magnesium, and PTH. In addition to renal and liver function<br>Other extra serum indices to be checked especially during the 1st trimester: serum zinc, copper, selenium, and vitamin E | • Serum indices to be checked every 3 months: full blood count, vitamins A, B12, iron, ferritin, transferrin, and folic acid. In addition to transcobalamin<br>• Serum indices to be checked every 6 months: INR, prothrombin time, serum vitamin K1, vitamin D, protein, albumin, calcium, phosphate, magnesium, and PTH. In addition to renal and liver function<br>• Other extra serum indices to be checked especially during the 1st trimester: serum zinc, copper, selenium, and vitamin E | |

(Alamri & Abdeen, 2022)

33

33

# Micronutrient Recommendations

**Table 1.** Recommended intake of micronutrients and vitamins in physiological pregnancy and in pregnancy after bariatric surgery.

| | DRI/RDA/AI | BS | AGB | Note |
|---|---|---|---|---|
| Folic acid | 0.6 mg | 0.4 mg–1 mg | | 4–5 mg in obese and diabetic women |
| Calcium | 1000 mg | 1200–1500 mg | | |
| Copper | 1 mg | 2 mg | >1 mg | |
| Iron | 27 mg | 45–60 mg | >18 mg | |
| Selenium | 60 µg | 50–100 µg | | |
| Zinc | 11 mg | 8–22 mg | | |
| Vitamin A | 10,000 IU | 5000 IU–10,000 IU | | Beta-carotene form in pregnancy |
| Vitamin B1 | 1.4 mg | <12 mg | | |
| Vitamin D | 600 IU | >1000 IU (40 mcg) | | |
| Vitamin E | 15 mg | 15 mg | | |
| Vitamin K | 90 µg | 90–120 µg | | |

BS: bariatric surgery; AGB: adjustable laparoscopic binding; DRI: dietary reference intakes; RDA: recommended dietary allowances; AI: adequate intake.

Burlina et al., 2023

34

34

# Macronutrient Recommendations

| | General Patients after BS [19] | General Pregnant Women [21] | Pregnant Women after BS [18] |
|---|---|---|---|
| Energy intake | No specific recommendation | +340 Kcal/day in the second trimester<br>+452 Kcal/day in the third trimester | Individualized on the basis of pre-pregnancy BMI, gestational weight gain, and physical activity level |
| CHO | No specific recommendation | 45–65% of total energy intake | If hyper- or hypoglycemia, modify CHO quantity or quality<br>If dumping syndrome, avoid simple CHO, use protein and low GI CHO, and divide food into six small meals |
| Protein | 60 g/day and up to 1.5 g/kg ideal body weight per day | 10–35% of total energy intake | No specific recommendation; refer to recommendations for general patients after BS |
| Fat | No specific recommendation | 20–35% of total energy intake | No specific recommendation |
| Fluid | No specific recommendation | 3 L/day | No specific recommendation |

Burlina et al., 2023

35

35

# Nutrition Therapy-Pregnancy

- Avoid “eating for two”
- Reinforce importance of adequate nutritional intake
  - Many women report only concern is weight regain (Vasilevski et al., 2023).
  - Benefits of following IOM weight gain guidelines
- Focus on quality of food choices
- Utilize small frequent meals if needed
- Manage cravings, nausea/vomiting, hydration
- Avoidance of highly processed carbohydrates
- Educate on appropriate weight gain benefits
- Encouraged regular follow-up

36

36

# Nutrition Therapy-Breastfeeding

- Energy needs:
  - 500 kcal/day (0-6 months)
  - 400 kcal/day (6-12 months)
- Protein needs:
  - 71 grams per day OR
  - 1.3 gm/kg body weight
- Carbohydrate needs:
  - 210 grams per day
  - This is typically much higher than recommended for post-weight loss surgery intake
- Goals:
  - Meet both maternal needs and optimize breast milk production
  - Work toward achieving pre-pregnancy weight

37

37

# Bariatric Surgery and Breastfeeding

Maternal benefits

- Promotes faster shrinking of the uterus
- Reduces postpartum bleeding
- Decreases risk of breast and ovarian cancer
- Delays resumption of the menstrual cycle
- Improves bone density
- Decreases risk for hip fracture
- Improves glucose profile in gestational diabetics
- Strengthens bond with infant
- Enhances self-esteem in maternal role
- Eliminates the need for preparing and mixing formula
- Saves money not spent on formula

Infant benefits

- Provides optimal nutrition for infant
- Guarantees safe, fresh milk
- Enhances immune system
- Protects against infection and non-infectious diseases
- Protects against allergies and intolerances
- Decreases risk of diarrhea and respiratory infections
- Promotes correct development of jaws, teeth, and speech patterns
- Decreases risk of childhood obesity
- Increases cognitive function
- Reduces risk for heart disease
- Increases bonding with mother

38

38

# Bariatric Surgery and Breastfeeding

**Does a history of weight loss surgery impact a woman's ability to breastfeed and/or the composition of breastmilk?**

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39

## Bariatric Surgery and Breastfeeding

- Similar breastmilk composition after weight loss surgery (Shawe, et al., 2019).
  - One study saw increase in protein and total carbohydrate concentration but only at weeks 4 and 5 (Jans, et al., 2017).
    - Potentially due to optimal bioavailability of breastmilk
    - Needs additional research on how this could impact the mother
  - Breastmilk had adequate nutrients and no long-term effects were reported when micronutrients were corrected (Adsit & Hewlings, 2022).
  - Nutritional content of breastmilk more likely to be dependent on maternal nutritional status vs dietary intake
- Decreased energy intake of 25%-35% in health weight women for less than 10 weeks did not affect milk production volume
  - May have effect on fat content (Barbosa, 1997).
  - Protein consumption (1.0g/kg vs 1.5 g/kg) did not impact breast milk protein levels (Motil, 1995).

40

40

## Dietary Counseling Challenges

- High quality food choices
  - Whole foods
  - Focus on protein (supplements if needed)
- Caloric recommendations
  - Recommended no less than 1800 kcal/day
  - Typical intake s/p WLS ~ 1300 kcal/day
- Hunger
  - Increased appetite with breastfeeding
  - Need for increased hydration
- Infant food allergies/intolerances
  - Many protein supplements are whey/dairy/soy based
  - Limiting high-fiber foods based on infant response

41

41

## Mindful Eating and Hunger Cues


42

42

# Balancing Meals


43

43

# Overall Recommendations

- Consider surgery type (restrictive/malabsorptive)
- Encouraged follow up after bariatric surgery
- Educate on contraception and encourage to wait at least 12-18 months before onset of pregnancy
- Follow up throughout pregnancy with a multidisciplinary team
- Monitor oral tolerance, adequate intake, concerns for nausea/vomiting
- Monitor maternal weight gain and intrauterine growth
- Screen for gestational complications
- Encourage adequate supplementation
- Encouraged lactation and nutrition follow-up

44

Breton et al., 2023

44


45

45

## Getting Back on Track

- Focus first on health and wellbeing of mom and baby—then focus on weight loss
- Tools to aid with weight regain following pregnancy
  - Behavior modification—diet and exercise
  - Meal replacement programs (New Direction)
  - Medication management
    - Helpful with appetite regulation
    - Not recommended while breastfeeding or trying to become pregnant
  - Revisional surgery
    - Other options are trialed first
    - No revision for RYGB

46

46

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47


48