Lactation AND

Gestational Diabetes

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6TH LECTURE

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- Physiology & Hormonal Control
- Key Hormones
- Breast Anatomy
- Stages of Lactation
- Benefits of Breastfeeding
- Milk Components And Functions
- Determinants of Milk Volume
- Effects of Lactation on the Mother
- Effects Of The Maternal Diet On Milk Composition
- Nutritional Requirements of Lactating Mothers
- Food and drinks to avoid when breastfeeding
- Counseling about common concerns

Definition of Lactation

Lactation is the process of producing and secreting breast milk from the mammary glands, typically following pregnancy.

Physiology & Hormonal Control

Baby Suckling

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Brain Sends Signal

↓

Prolactin → Milk Production (Alveoli)

Oxytocin → Milk Ejection (Myoepithelial Cells)

↓

Milk Flows to Baby

Key Hormones

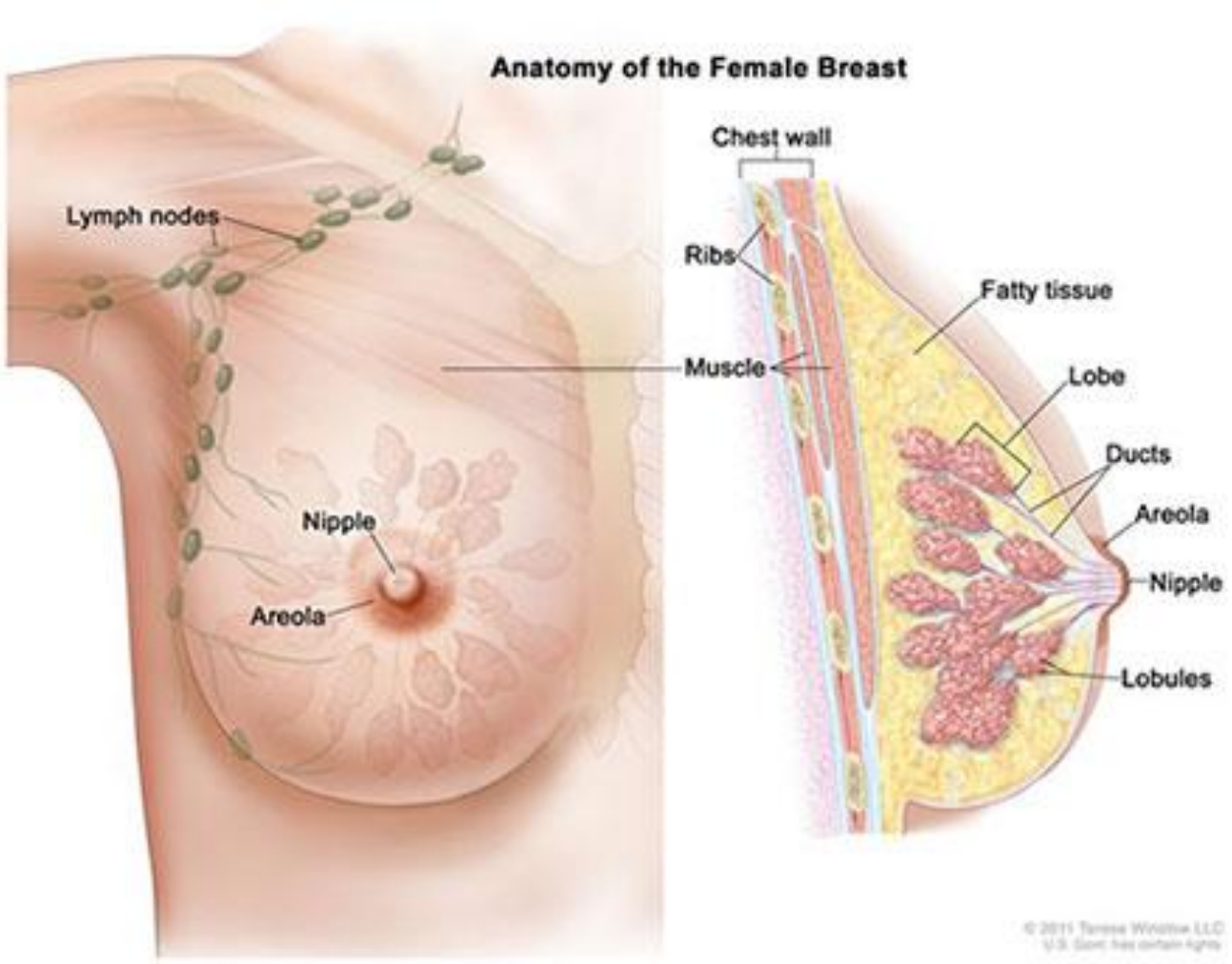
Prolactin – Milk Production

- Released from the pituitary gland
- Stimulated by baby sucking
- Tells the breast to **produce milk**

Oxytocin – Milk Ejection (Let-Down)

- Also from the pituitary
- Causes the breast muscles to contract
- Helps **push milk out**
- Triggered by suckling, baby crying, or even thinking of baby

Breast Anatomy



Stages of Lactation

1. Lactogenesis I (Pregnancy → Birth)
2. Lactogenesis II (Day 2–4 after birth)
3. Lactogenesis III (Day 10 → End of breastfeeding)
4. Involution (After weaning)

Lactogenesis I (Pregnancy → Birth)

When: 2nd half of pregnancy (~16 weeks)
What: Breasts develop milk-making capacity
Milk: Colostrum produced (antibody-rich, thick, yellow)
Hormone control: Progesterone inhibits full milk flow

Lactogenesis II (Day 2–4 after birth)

Trigger: Placenta delivered → progesterone drops
What: Milk comes in - copious milk production begins
Milk: Transitional milk (between colostrum & mature milk)
Physical sign: Breast fullness/engorgement

Lactogenesis III (Day 10 → End of breastfeeding)

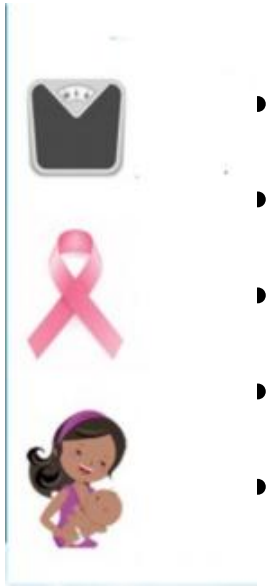
When: Day 10 postpartum onward
What: Mature milk established
Control: Supply & demand system takes over
Key: Frequent feeding/pumping = sustained production

Involution (After weaning)

When: Milk removal decreases/stops
What: Milk production ceases, breast tissue returns to pre-pregnancy state
Timeframe: Gradual process over weeks/months

Benefits of Breastfeeding

1. Benefits For The Mother



- Uterus returns to normal faste
- Less bleeding after birth
- Helps weight loss
- Lowers cancer risk
- Improves bonding

2. Benefits For The Baby

- Provides **complete nutrition** for growth.
- Strengthens **immune system** – reduces infections.
- Promotes **healthy brain development**.
- Reduces risk of **allergies, obesity, diabetes** later in life.
- Enhances **bonding with mother**.

Milk Components And Functions

- **Water:** 87%
- **Carbohydrates:** 7% (60-70 g/L)
  - primarily lactose, important for mineral absorption
  - oligosaccharides (HMOs) act as prebiotics, promoting healthy gut bacteria.
- **Fat:** 3.8% (35-40 g/L)

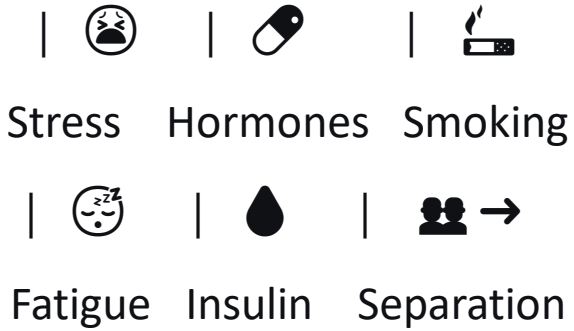
•Supply energy and essential fatty acids (DHA, ARA) for brain and vision.

- **Protein:** 1% (8-10 g/L)
  - Include antibodies (immunoglobulins), enzymes, and growth factors, easily digestible
- **Vitamins & Minerals:** Calcium, iron, iodine, vitamins

Determinants of Milk Volume

Milk removal is the main factor; incomplete or infrequent feeding reduces supply.

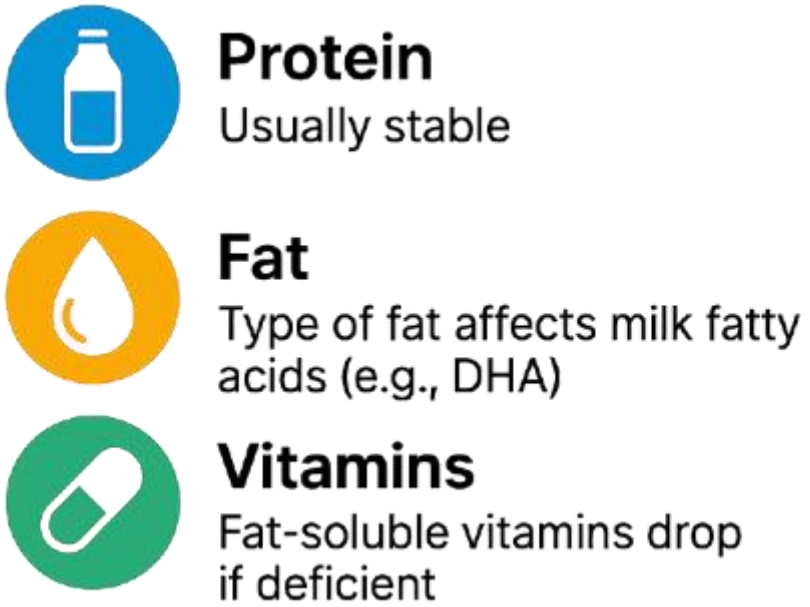
Other factors that decrease milk: stress, fatigue, illness, insulin resistance, hormonal contraceptives, smoking, and mother-infant separation.



Effects of Lactation on the Mother

Weight: Mild gradual loss in first 6 months; varies by pregnancy weight gain, age, lifestyle.
Lean Body Mass: Generally preserved.
Vitamins: Increased needs; supplements if diet is limited.
Bones: Temporary bone loss during lactation; recovers after weaning; no long-term fracture risk.

Effects Of The Maternal Diet On Milk Composition



Balanced diet supports healthy milk severe deficiency can affect quality

Nutritional Requirements of Lactating Mothers

1. Energy

- Extra **400–500 kcal/day** for milk production.

2. Protein

- **1.1–1.3 g/kg/day**

Sources: meat, eggs, dairy, legumes.

3. Carbs & Fats

- Carbs: **main energy source** – whole grains, fruits.
- Fats: **essential for baby's brain** – fish, nuts, seeds. Limit saturated/trans fats.

4. Fluids

- **2.5–3 L/day** – water, milk, soups.

5. Vitamins & minerals

- Calcium & vitamin D: same as non-lactating women; vitamin D supplement needed for baby
- Multivitamin: recommended if diet is poor (≥150 µg iodine, ≤1000 µg folate)

Food and drinks to avoid when breastfeeding

Caffeine 

- If you do drink caffeine, try not to have more than 300mg a day.

Alcohol 

- It's safer not to drink any alcohol while breastfeeding, but an occasional drink is unlikely to harm your baby – 1 or 2 units of alcohol, once or twice a week, should be fine.
- allow 2 to 3 hours in between drinking and breastfeeding

Fish 

- limit swordfish, marlin or shark to 1 portion a week
- do not eat more than 2 portions of oily fish a week (like fresh tuna, salmon, trout, mackerel, herring, sardines and pilchards)

Counseling about common concerns

Dieting and drugs for weight loss

GLP-1 drugs (e.g., semaglutide) likely low risk; oral forms may increase infant exposure → caution

Safe postpartum weight loss: restrict 500 kcal/day + exercise (~0.5 kg/week)

Very low-carb/ketogenic diets **not recommended** → risk of lactation ketoacidosis

Special Diets

Vegetarian: May need protein, calcium, vitamin D, B12 supplements

Vegan: Must supplement vitamin B12

Fasting: Short-term fasting minor effect; long-term fasting may affect maternal nutrition

Food avoidance: Not recommended for allergy prevention unless infant has confirmed allergy

Post-Surgery & Lifestyle

Bariatric surgery: Breastfeeding encouraged; continue supplements

Alcohol: Wait 2 hours per standard drink before nursing; avoid heavy intake

Caffeine: Moderate intake generally safe

Gestational Diabetes

Content

- Introduction
- Prevalence
- Why It Happens (Pathophysiology)
- Risk Factors
- Diagnosis
- Complications
- Glucose Monitoring
- Management
- Medical Nutrition Therapy (MNT)
- Meal Plan Structure
- Pharmacotherapy
- Postpartum Follow-Up for GDM
- Prognosis

Introduction

- Gestational diabetes is a type of diabetes that can develop during pregnancy in individuals who don't already have diabetes.

- Usually appears in **2nd or 3rd trimester**.

Prevalence

The global prevalence of **GDM** is estimated to be approximately 14% of all pregnancies when using standardized diagnostic criteria. This translates to about 1 in 6 live births being affected by some form of hyperglycemia during pregnancy each year.

Why It Happens (Pathophysiology)

- Insulin helps glucose (sugar) in the blood enter the body's cells for energy.
- During pregnancy, the **fetus and placenta make hormones** that cause **insulin resistance**.
- Most pregnant individuals can make enough **extra insulin** to keep blood sugar normal.
- Some cannot make enough → **blood sugar rises** → this leads to **gestational diabetes**.

Risk Factors

- Overweight/obesity
- Family history of diabetes
- Previous GDM
- Age > 25 years
- Polycystic ovary syndrome (PCOS)
- Previous large baby (>4 kg)
- Certain ethnicities (Hispanic , Native American , Asian)

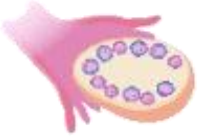

Ethnicity


Family history


Arterial hypertension


Polyhydramnios


Overweight


PCOS

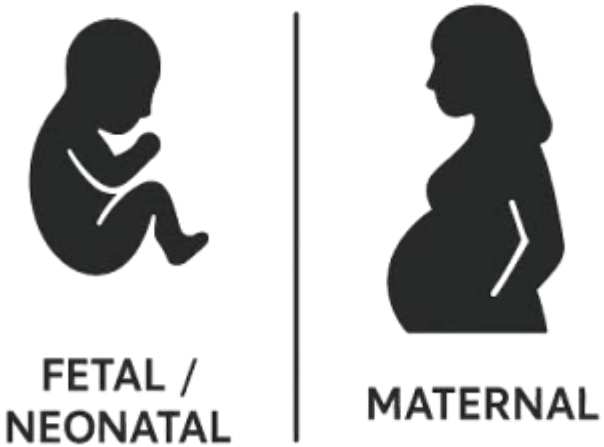
Complications

➢Maternal

- Preeclampsia.
- Increased risk of C-section.
- Higher chance of developing type 2 diabetes later.

➢Fetal/Neonatal

- Macrosomia (large baby).
- Birth trauma.
- Neonatal hypoglycemia.
- Jaundice.
- Increased long-term obesity/diabetes risk.



Glucose Monitoring

- Monitor glucose several times daily:
  - Fasting (before breakfast)
  - 1–2 hours after meals
- Mild GDM patients (slightly elevated readings, no fetal overgrowth, normal amniotic fluid):
  - Monitoring can be reduced to every other day

Glucose Targets

- Fasting: <95 mg/dL (5.3 mmol/L)
- 1-hour post-meal: <140 mg/dL (7.8 mmol/L)
- 2-hour post-meal: <120 mg/dL (6.7 mmol/L

Diagnosis

- **All pregnant individuals** should be tested.
- Usual testing time: **24–28 weeks** of pregnancy.
- **Earlier testing** (first prenatal visit) if you have risk factors

1. First Test: 1-Hour Glucose Screening (50 g)
2. Second Test: 3-Hour Glucose Tolerance Test (100 g)
3. Alternative Test (One-Step, 75 g)

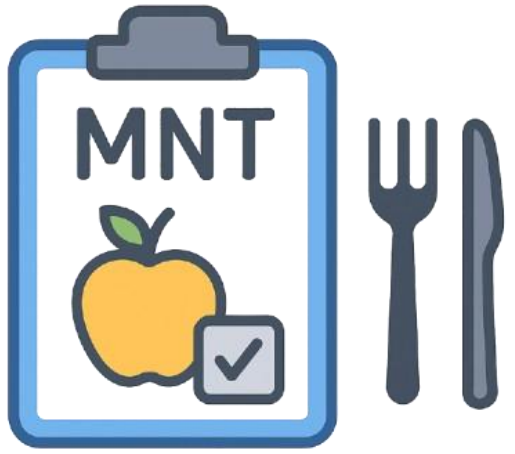
Management

Lifestyle Modification

- **Exercise** 30 minutes walking after meals.
- Good sleep & stress management.
- Eat a **healthy, balanced pregnancy diet**
- **Avoid sweets & sugary drinks**; use alternative sweeteners in moderation

Medical Nutrition Therapy (MNT)

- **Goal:** Achieve normoglycemia to support fetal health while providing adequate nutrition for pregnancy.
- **Energy Needs:** Do NOT restrict calories severely! Based on pre-pregnancy BMI. Example: 30 kcal/kg for normal BMI; 22-25 kcal/kg for obese BMI.
- **Key Message:** It's about quality and timing of food, not just "eating less sugar."



Meal Plan Structure

A typical meal plan for patients with GDM includes three small- to moderate-sized meals and two to four snacks.

❖Calories

- Same as non-GDM pregnancy
- Example: Normal BMI = add 340 cal/day (2nd trimester), 452 cal/day (3rd trimester)
- Work with an RD if under/overweight

❖Carbohydrates

- Minimum 175g/day + 28g fiber
- ~40% of total calories
- Quality matters: high-fiber, low-glycemic carbs
- Adjust per meal by 15–30g based on post-meal glucose
- Don’t restrict too much → risk of ketones or too much fat intake

❖Protein & Fat

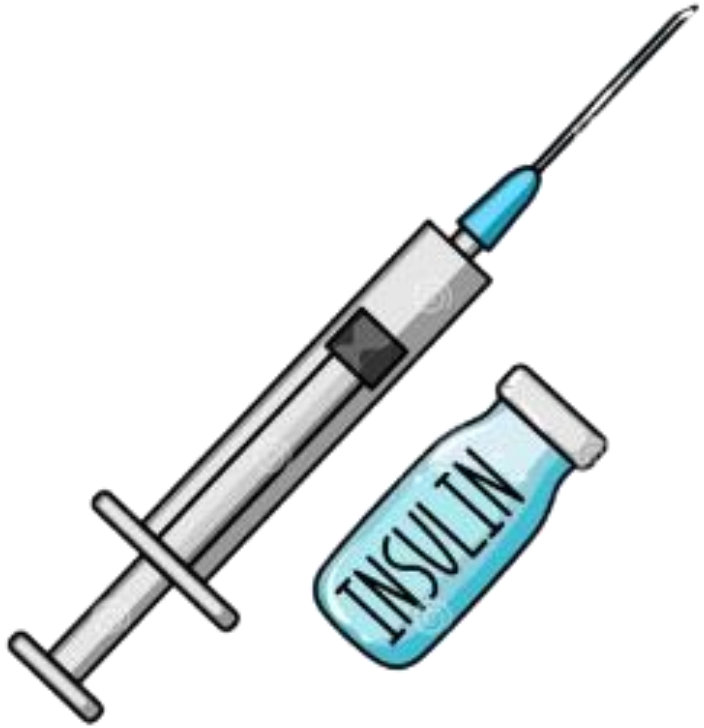
- Protein: ~20% of calories (~71g/day), include in all meals/snacks
- Fat: ~40% of calories, focus on unsaturated fats, limit saturated fat (<7% total calories)

Pharmacotherapy

When prescribed:

- If diet + exercise do not control blood sugar (≥30% readings above target in a week)
- If there is fetal hyperinsulinemia

(AC >75th percentile or EFW ≥90th percentile)



- Oral Medications
- Insulin

Postpartum Follow-Up for GDM

- **Test for type 2 diabetes:** 4–12 weeks postpartum; repeat every 3 years if normal
- **Lifestyle:** Healthy weight + regular exercise to reduce diabetes and heart disease risk

Prognosis

Most patients with GDM are normoglycemic after giving birth

But are at high risk for developing recurrent GDM, prediabetes (impaired glucose tolerance or impaired fasting glucose), and overt diabetes.