Faculty of Medicine
Introduction to Community Medicine Course
(31505201)
Nutritionally Vulnerable Groups
Breast feeding & Breast milk
Formula feeding

By
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MD MPH JBCM PhD

9+11 -10-2017
Attention!!!!!!!

- Mon 25-9 Introduction and Terminology used in nutrition
- Wed 27-9 The Nutrients & their Categories
- Mon 2-10 Spectrum of public nutrition problems: Malnutrition & its Ecology and Common nutritional disorders in Jordan
- Wed 4-10 Assessment of Nutritional Status. Anthropometric Assessment.
- **Wed 9+11 -10** Breast feeding & Breast milk. Formula feeding
Introduction to course 31505201 (cont...) Course Content

- **Week 1**  Unit 1: Introduction to Health and Community Health
- **Week 2**  Unit 2 *Nutrition and* Nutrition Assessment and Diet
- **Week 3**  Unit 2 (cont.) *Nutrition and* Nutrition Assessment and Diet
- **Week 4**  Unit 2 (con..): Infant and Breast Milk Characteristics
- **Week 5**  **Unit 3: Public Health/Environmental Health**
- **Week 6**  Unit 4: Epidemiology .Epidemiology :Study design
- **Week 7**  Unit 5: Primary Health care
- **Week 8**  Unit 6: Demography, Data and Biostatics
- **Week 9**  Midterm assessment *(Exams.)*15-11-2017
- **Week 10**  Unit 8  Public Health Surveillance
- **Week 11**  Unit 9:  Prevention and Control of Diseases
- **Week 12**  Unit 10:  Health Education and Communication
- **Week 13**  Unit 11:  Screening
- **Week 14**  Unit 12:  Health Administration and healthcare management
- **Week 15**  Unit 13:  Health Research
- **Week 16**  *Final assessment (Exams.)*
انتباه ؟؟؟؟؟؟
الحضور والغياب؟؟؟؟؟؟
التحضير اليومي
للامتحان النصفي
2017-11-15
## Presentation outline

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vulnerable Groups and Nutrition</td>
<td>08:00 to 08:10</td>
</tr>
<tr>
<td>Pregnancy and Nutrition</td>
<td>08:10 to 08:40</td>
</tr>
<tr>
<td>Lactation and</td>
<td>08:40 to 09:00</td>
</tr>
<tr>
<td>Infants Feeding</td>
<td>09:00 to 09:15</td>
</tr>
<tr>
<td>Breast Feeding</td>
<td></td>
</tr>
<tr>
<td>Other Vulnerable Groups</td>
<td>09:15 to 09:35</td>
</tr>
</tbody>
</table>

6
Quiz 2 minutes

- Main difference between

<table>
<thead>
<tr>
<th>Marasmus</th>
<th>kwashiorkor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vulnerability

• *Vulnerability* is the *degree* to which a population, individual or organization is unable to anticipate, cope with, resist and recover from the impacts of disasters.

What is the definition of an aggregate?

• "A vulnerable population group is a subgroup of the population who is more likely to develop health problems as a result of exposure to risk or to have worse outcomes from these health problems than the population as a whole."
Vulnerable Populations:

- Poor and Homeless
  - Health Care for the Homelessness Information Resource Center
- Pregnant Adolescents
- Migrant Workers
  - High Incidence of Tuberculosis in Migrant Workers
- Severely Mentally Ill
  - Outcasts on Main Street
- Substance Abusers
  - Details About Health Risks and Substance Abuse
- Abused Individuals
- Persons with Communicable Disease and Those at Risk
- Persons with HIV
Figure 7.1
The life-cycle of malnourishment

Source: UN ACC/SCN 2000.
Vulnerable groups:

They are at risk due to increased physiological requirements

1. Infancy
2. Preschool and school age group
3. Adolescence
4. Pregnancy and lactation
5. Old age
Infancy

- Infancy is the first year of life.
- 0-6 months: Exclusive breast feeding
- 6-12 months: Weaning food is provided in this period

The capacity of the stomach of the infant & the ability to digest various components changes rapidly
Physiologic Development

• Length of gestation, the mother’s pre-pregnancy weight, and the mother’s weight gain during gestation determine an infant’s birth weight

• After birth, the infant’s growth is influenced by genetics and nourishment

• **Term infant**: born 37 to 42 weeks’ gestation

• **Premature**: an infant born before 37 weeks’ gestation
Low–Birth-Weight Infant

- **Low birth weight**: an infant who weighs less than 2500 g (5½ lb) at birth
- **Very low birth weight**: an infant who weighs less than 1500 g (3⅓ lb) at birth
- **Extremely low birth weight**: an infant who weighs less than 1000 g (2¼ lb) at birth
Low–Birth-Weight Infant–cont’d

- **Gestational age**: the age of the infant at birth, determined by length of pregnancy
- **Small for gestational age** (SGA): weight <10th percentile of standard weight for gestational age
  - Intrauterine growth restriction (IUGR)
- **Appropriate for gestational age** (AGA): weight 10^{th} to 90^{th} percentile
- **Large for gestational age** (LGA): weight > 90th percentile
Energy Requirements

• Infants adjust intake to meet energy needs
• Sensitivity to hunger and satiety cues
• Monitor gains in weight and length over time
• Formula-fed infants consume more kcals than breast-fed infants
## Reference Nutrient Intakes

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Weight (kg)</th>
<th>Fluid (mls)</th>
<th>Energy (kcals/kg)</th>
<th>Protein (g/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>4.4</td>
<td>150</td>
<td>115 – 110</td>
<td>2.8</td>
</tr>
<tr>
<td>4 - 6</td>
<td>7.2</td>
<td>130</td>
<td>95</td>
<td>1.8</td>
</tr>
<tr>
<td>7 - 9</td>
<td>9.0</td>
<td>120</td>
<td>95</td>
<td>1.5</td>
</tr>
<tr>
<td>10 – 12</td>
<td>10.0</td>
<td>110</td>
<td>95</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Protein Requirements

• Higher per kg weight than for adults because of rapid growth
• Recommendations based on composition of human milk
• Require large percentage of essential amino acids than adults
• Human milk or infant formula; supplemental protein sources after age 6 months
Lipid Requirements

- Minimum of 30 g fat per day
- Essential fatty acid content of human milk vs infant formula: linoleic and linolenic acids, as well as longer chain arachidonic and docosahexaenoic acids
- Linoleic acid should provide 3% of total kcals
- Long-chain polyunsaturated fatty acids; visual acuity and neural development
Carbohydrate Requirements

• 30% to 60% of energy intake
• Lactose tolerance
• Avoid honey and corn syrup; source of botulism spores
Water Requirements

• 0.7 L/day up to age 6 months; 0.8 L/day for age 7 to 12 months

• Renal concentrating capacity may be less than for adults

• May require additional water in hot, humid environments

• Hypernatremic dehydration; neural consequences
Mineral Requirements

• **Calcium:** more is retained from breast milk than from infant formula

• **Iron:** supplement with iron-fortified cereal or fortified infant formula by 4 to 6 months; deficiency has cognitive effects

• **Zinc**

• **Fluoride**
Vitamin Requirements

- **Vitamin D**: Supplements recommended for breast-fed infants, especially those with dark skin
- **Vitamin B\textsubscript{12}**: Depends on maternal diet and status
- **Vitamin K**: Hemorrhagic disease of the newborn; preventive injection at birth or supplements
- **Supplementation issues**
Human Milk

• Food of choice for infants
• Provides appropriate energy and nutrients
• Specific and nonspecific immune factors
• Prevents diarrhea and otitis media
• Allergic reactions are rare
• Attachment and bonding
• Maternal health benefits
Breastfeeding Benefits

• **Immunological:** Breastfed babies are at lower risk of infection.

• **Nutritional:** Easy to digest, optimal blend of nutrients, low risk of contamination.

• **Psycho/social:** Bonding, pain relief, maternal confidence & empowerment.

• **Financial:** Milk is always available: shorter hospital stay.
Benefits

• **Optimal nutrition for human infant**
  – Correct nutrient composition – macro/micronutrients
  – Nutritionally complete until 6 mths

• **Immunological advantages**
  – Macrophages: lysozymes and lactoferrin
  – Lymphocytes: interferon and IgA
  – Bifidus factor
  – Antibodies
  – Anti-trypsin factor
Antiinfective Factors in Human Milk and Colostrum

- Antibodies and antiinfective factors
- Secretory immunoglobulin A (sIgA)
- Lactoferrin
- Lysozymes
- Enhances growth of Lactobacillus bifidus
Support for Breast-Feeding

• Benefits for cognitive development, prevention of asthma and overweight

• support exclusive breast-feeding for 6 months and breast-feeding plus weaning foods for the next 6 months

• Contraindications to breast-feeding: certain maternal infections (e.g., HIV), maternal use of psychotropic or some other drugs
Human vs Cow’s Milk

• Amount and type of protein affects digestibility
• Lactose content
• Essential fatty acids, cholesterol, lipase
• Vitamins and minerals
• Renal solute load (protein, sodium, potassium)
## Comparison of human milk with cow’s & buffalo’s milk (values per 100g)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Human milk</th>
<th>Cow’s milk</th>
<th>Buffalo’s milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water (g)</td>
<td>88</td>
<td>87.5</td>
<td>81</td>
</tr>
<tr>
<td>Energy (kcal)</td>
<td>65</td>
<td>67</td>
<td>117</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>1.1</td>
<td>3.2</td>
<td>4.3</td>
</tr>
<tr>
<td>Carbohydrate (g)</td>
<td>7.4</td>
<td>4.4</td>
<td>5</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>3.4</td>
<td>4.1</td>
<td>6.5</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>28</td>
<td>120</td>
<td>210</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>11</td>
<td>90</td>
<td>130</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>-</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Carotene (mcg)</td>
<td>137</td>
<td>174</td>
<td>160</td>
</tr>
<tr>
<td>Thiamine (mcg)</td>
<td>0.02</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Riboflavin (mcg)</td>
<td>0.02</td>
<td>0.19</td>
<td>0.1</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Caseinogen/ Lactalbumin</td>
<td>1:2</td>
<td>3:1</td>
<td>-</td>
</tr>
</tbody>
</table>
## Composition of milk (per 100 ml)

<table>
<thead>
<tr>
<th>Nutrients (gm)</th>
<th>Human</th>
<th>Cow</th>
<th>Buffalo</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHO</td>
<td>6.8</td>
<td>5.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Protein</td>
<td>1.5</td>
<td>3.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Fat</td>
<td>4.0</td>
<td>3.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Energy</td>
<td>68</td>
<td>66</td>
<td>103</td>
</tr>
</tbody>
</table>
Formulas

- Based on cow’s milk or soy products
- Decrease in anemia with use of iron-fortified formulas
- Questions associated with soy-based formulas
- Special needs formulas
- Fresh cow’s milk and imitation milks not recommended before age 1 year
- Formula preparation: cleanliness, refrigeration, warming, discarding used formula
Possible Problems

- Over-concentration
  - Hypernatraemia and dehydration
  - Inappropriate calorie density

- Over-dilution
  - Excess volume
  - Vomiting and hyponatraemia
  - FTT and malnutrition

- Hygiene
  Safefood: “How to prepare your baby’s bottle feed”
Infant Foods

• Dry cereal fortified with electrolytically reduced iron
• Jars for fruits and vegetables provide carbohydrates and vitamins A and C
• Issues with mixed foods and desserts
• Home-prepared infant food: **avoid added salt and sugar**
Feeding

• Early feeding patterns
• Development of feeding skills
• Addition of semisolid foods
• Weaning from breast or bottle to cup
• Early childhood caries
• Feeding older infants: type of food, serving size, forced feeding, environment
WEANING

- Process of introducing semi-liquid to semi-solid foods other than breast milk.
- The transition of food pattern has to keep pace with the child’s growth who triples his birth weight and 1 ½ times his birth length by the end of one year - Time of introduction of food type.
- Consistency, frequency of food, calorie density and nutrient density need to be monitored closely.
- Hygiene
When to start weaning

• At 6 months of age WHO reco. Complementary feeding initiated and Supplementary to breast milk started. Breast milk output 600-700 ml/d (healthy mother)

• Less milk output (malnourished mother)---- underweight child------ initiate weaning early (at 5 months of age).

• Continue breast feeding (frequency and amount reduced)
How to initiate weaning and progress

Frequency:

• Energy requirement on a per kg basis, is 3 times more than the adults in infants and 2 times more than the adults in case of children till 2 years of age.
• Children have to be fed frequently since they can eat small amount at a time due to their little capacity.

Till 5-6 months - child is given breast feeds on demand i.e. 9-10 times over 24 hours.
From 6- 8 months - As the child grows, his requirements increase and he starts to accept larger volume and thicker consistency at a time - feed him 7-8 times/d
From 9- 12 months - child normally eats 6-7 times per day and each time.
By 12 - 15 months - child eats at least 6 times per day.
By 18 months - child’s eating schedule of 5-6 times /day gets fixed
  3 regular meals – Breakfast, Lunch and dinner and
  3 in-between healthy snacks – midmorning (recess time), evening at 4:30 – 5 PM
  bedtime.
# Weaning Chart

<table>
<thead>
<tr>
<th>6 MONTHS</th>
<th>CARBS</th>
<th>PROTEINS</th>
<th>VIT/VEG</th>
<th>FRUITS</th>
<th>SPICES</th>
<th>OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby rice</td>
<td>Peas</td>
<td>Green beans (Michiri)</td>
<td>Avocados</td>
<td>butter (unsalted)</td>
<td>Uji Yoghurt Formula</td>
<td></td>
</tr>
<tr>
<td>Oat cereals</td>
<td></td>
<td>Pumpkin Butter nut Snow peas</td>
<td>Apples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td></td>
<td></td>
<td>Bananas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pears</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pawpaws</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Prunes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Melon</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7-8 MONTHS</th>
<th>CARBS</th>
<th>PROTEINS</th>
<th>VIT/VEG</th>
<th>FRUITS</th>
<th>SPICES</th>
<th>OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nduma Potatoes</td>
<td>Chicken Kamande (Lentils)</td>
<td>Carrots Peas Zucchini/courgette Broccoli</td>
<td>Mangoes Grapes (peeled &amp; cut up)</td>
<td>Dhania Onion Garlic Ginger</td>
<td>Yoghurt Cheese Drinking chocolate (DC) Bread</td>
<td></td>
</tr>
<tr>
<td>Matoke (cooked bananas)</td>
<td>Beans Green grams (Ndengu)</td>
<td>Terere Cauliflower</td>
<td>Orange Tangerine</td>
<td>Olive oil Coconut milk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9-12 MONTHS</th>
<th>CARBS</th>
<th>PROTEINS</th>
<th>VIT/VEG</th>
<th>FRUITS</th>
<th>SPICES</th>
<th>OTHERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ugali Spaghetti Rice</td>
<td>Mince meat (beef) Njahi Liver Pork</td>
<td>Beetroot Celery Eggplant Cucumber Spinach Sukuma</td>
<td>Kiwi Passion fruit</td>
<td>Hoho Leeks Tomatoes Paprika Masala</td>
<td>Eggyolk Weetabix Fresh juice</td>
<td></td>
</tr>
</tbody>
</table>

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**Three Day Rule**

When you introduce a new food over the course of several days, you are better able to determine exactly how your baby is reacting to that food. It is important to follow the “three day wait” rule when introducing your baby to new solid foods, especially in the beginning stage. This is most important if you and/or your family members have a history of food allergies.

---

*SALT is not recommended before 1 year as it overworks the kidney and the amount of sodium. Spice up your baby's food so that it is not blunt and boring.
*Always consult your paediatrician before introducing solids to your baby.
*Honey, nuts, eggs can be introduce at 1 year and you do not need to add sugar to DC.
<table>
<thead>
<tr>
<th>مرحلة</th>
<th>المرحلة الأولى</th>
<th>المرحلة الثانية</th>
<th>المرحلة الثالثة</th>
</tr>
</thead>
<tbody>
<tr>
<td>عمر</td>
<td>تبدأ في عمر السته أشهر أو قبل ذلك ولكن ليس قبل الأربعة أشهر (17 أسبوعاً)</td>
<td>من 6 إلى 9 أشهر</td>
<td>من 9 إلى 12 شهراً</td>
</tr>
</tbody>
</table>
| المهارات التي يجب تعلُّمها | تناول الطعام بالملعقة تنقل الطعام من الجهة الأمامية لقم الطفل إلى الجهة الخلفية لإبلاعه إعداد طعام مهروس أكثر سمكاً نقل قطع الطعام من جهة إلى أخرى داخل الفم مضخ الطعام تناول الطفل الطعام بمفرده باستخدام اليدين والأصابع ارتشاف السوائل من الكوب مضخ طعام مقروء ومقطّع | تناول الطعام بمفرده باستخدام ملعقة المطحّة |}

Weaning

Clinical Paediatric Dietetics

ترجمة من الإصدار الثالث من
From 6-7 months

Introduce (along with BF)
- Fresh milk 200-250ml/day
- mashed banana/ custard 1/4 - 1/2
- Powdered murmura/ riceflakes 1/4- 1/2 katori in milk+sugar+fat
- Khichri (Liquid consistency) 1/4 - 1/2 katori
- Washed moong dal + rice + fat
- biscuit/ bread/Suji in milk +sugar+fat 1/4 - 1/2 cup
- Boiled mashed potato/ halwa
## From 8-9 months

Continue breast feeds

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh milk (includes curd)</td>
<td>250-400 ml/day</td>
</tr>
<tr>
<td>Banana OR any other seasonal fruit</td>
<td>3/4 - 1</td>
</tr>
<tr>
<td>Suji/sago/Dalia in milk + sugar + fat</td>
<td>1/2 - 1 katori</td>
</tr>
<tr>
<td>Khichri (semisolid consistency) (dal + rice + fat) OR rice-dal</td>
<td>1/2 - 1 katori</td>
</tr>
<tr>
<td>Biscuit/ bread in milk + sugar + fat</td>
<td>1/2 - 1 cup</td>
</tr>
<tr>
<td>Potato + vegetable</td>
<td>1/2 - 1 cup</td>
</tr>
</tbody>
</table>
From 10 - 12 months

Continue breast feeds

Fresh milk (includes curd) 400 - 500 ml/day

Banana OR any other seasonal fruit 1 or more

Suji/sago/Dalia/sevian in milk + sugar + fat (Thick) 1 katori or more

Khichri (semisolid consistency) (dal + rice + fat) OR rice-dal 1 katori or more

Biscuit/ bread/chapati/ paratha (by 1 year) 1 cup or more

Potato + any other vegetable as desired

Curd/ paneer/ groundnut/Egg
Focal Points

• Basic concepts of infant growth, development and nourishment are related.

• Nutrient needs of infants reflect rates of growth, energy expended in activity, basal metabolic needs, and the interaction of nutrients consumed.

• Infants grow rapidly in the first year of life; thus the types of infant feedings (human milk or formula), the composition of feedings, and the addition of solids to infants’ diets are important considerations.

• Human milk is the food of choice for infants; commercially prepared infant formulas, manufactured to approximate human milk, also promote typical growth and development.

• The use of solid foods (with thought given to the types of foods and portion sizes served) to support nourishment and developmental progress sets the stage for lifelong food habits.
Infant Nutrition

• Breast/Formula feed up to One year old
• Introduce solids from 6 months
• Include iron-rich foods in weaning diet
• Offer variety of tastes & textures
• Encourage drinking from a cup from 6-8 months
Childhood

- Toddlers 1-3 years
- Preschool children 3-5 years
- School-age children 5-12 years
- Adolescence 12-18 years
Nutrition in childhood

- Nutrition requirements are affected by a generally slowed and erratic growth rate between infancy and adolescence and a child individual needs.
- A child food choices are determined by numerous family and community factors.
- Nutrition intake and developing food patterns in young children are governed by food availability and food choices.
- Consideration in feeding young children are guided by meeting physical and psychosocial needs.
- Nutrition concerns during childhood relate to growth and development needs for positive health.
Energy and Protein

• Energy needs determined on the basis of basal metabolism, rate of growth, and energy expenditure

• The need for protein per kilogram of body weight decreases from approximately 1.1 g in early childhood to 0.95 g in late childhood
Recommended energy intakes for children

- At age 1-3 years 102 kcal/kg/day (1300 kcal/day).
- At age 4-6 years 90 kcal/kg/day (1800 kcal/day).
- At age 7-10 years 70 kcal/kg/day (2000 kcal/day).
Minerals and Vitamins

- Children between 1 and 3 years of age are at high risk for iron deficiency
- Calcium is needed for adequate mineralization and maintenance of growing bone
- Zinc is essential for growth.
- Vitamin D is needed for calcium absorption and deposition in bone
Malnutrition in children

*Protein-Energy Malnutrition (PEM):
  a. Kwashirchoire
  b. Marasmus
*Vitamin A deficiency
*Vitamin D deficiency
*Iron deficiency anemia
*Zinc deficiency
*Lead toxicity
Vitamin-Mineral Supplements

• Fluoride and dental caries
• At-risk groups: deprived families, parental neglect or abuse, anorexia or fad diets, chronic disease, weight-loss diets
• **Avoid megadoses**
• Complementary nutrition therapies
Intake Patterns

• Changes in food patterns over time
• Family environment
• Societal trends
• Media messages
• Peer influence
• Illness or disease
Feeding Preschool Children

- Developmental progress
- Growth rate slows
- Parents control foods offered and set limits on inappropriate behaviors
- **Importance of snacks**
- Portion sizes
- Sensory factors
- Physical environment
- Excessive intake of fruit juice
- Meals and snacks in day-care
- **Peer influence**
Feeding School-Aged Children

- Slow steady growth
- Influence of peers and significant adults
- School lunch program
- Special diets
- Home-packed lunches
- Importance of breakfast
- Snacks
Iron Deficiency

• One of the most common nutrient disorders of childhood
• Affects approximately 9% of toddlers
• Linked to lower test scores
• Dietary factors
Increased Nutritional Risk

• Pregnant women who are:
  • Drug or alcohol abusers
  • Vegetarians
  • Smokers
  • Anorexic or bulimic, underweight, or obese

• Pregnant women with:
  • Hyperemesis
  • Poor weight gain or weight loss
  • Dehydration, constipation
  • Pre-existing medical conditions
Factors Affecting Conception

- Extreme underweight or overweight
- Nutritional status
- Environmental toxins
- Elevated plasma homocysteine and deficiency of vitamin B₁₂
- Excessive caffeine intake
Practices incompatible with pregnancy

- Smoking
- Caffeine
- Illicit drugs
- Alcohol (causes Fetal Alcohol Syndrome)
- Nutrient megadoses
Recommended Weight Gain During Pregnancy

- Normal weight women: 11-16 kg
- Underweight women: 13-18 kg
- Overweight women: 7-11 kg
- Teenagers: 16-18 kg
Nutritional Risk Factors in Pregnancy

• Risk Factors presented at the onset of pregnancy
  * Age 15 years or younger
  35 years or older
  * Frequent pregnancies: three or more during a 2 year period
  * Poor obstetric history or poor fetal performance
  * Poverty
  * Bizarre food habits
  * Abuse of nicotine, alcohol, or drugs
  * Obesity and undernutrition
Nutritional Risk Factors in Pregnancy cont’d:

- **Risk factors occurring during pregnancy**
  
  *Low hemoglobin and/or hematocrit*
  
  Hemoglobin less than 12.0 gm  
  Hematocrit less than 35.0 mg/dl

*Inadequate weight gain*
  
  Any weight loss
  
  Weight gain of less than 1 kg per month after the first trimester

*Excessive weight gain: greater than 1 kg per week after the first trimester*
Nutritional Supplementation During Pregnancy

- Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Supplements for high-risk pregnancies
- Poor understanding of dietary adequacy
- Prenatal supplements
- Folate and iron
Physiologic Changes of Pregnancy

• Blood volume and composition
  – Blood volume increase
  – **Red cell volume increase**
  – **Nutrient concentration changes**

• Cardiovascular and pulmonary function
  – Increased cardiac output
  – Increased pulse rate
  – Cardiac hypertrophy
  – Decreased blood pressure
  – Increased oxygen requirements
  – Enhanced efficiency with gas exchange
Effects of nutrient deficiencies on pregnancy outcome

- Energy: Low infant birthweight
- Folate: Miscarriage and NTD (spina bifida)
- Vitamin A: Congenital malformations
- Vitamin D: Low infant birthweight
- Iron: Stillbirth, premature birth, and LBW
- Iodine: Cretinism (varying degree of mental and physical retardation in the infant)
- Zinc: Congenital malformations
Energy Needs During Pregnancy

• Metabolism increases 15%
• DRIs add 340 to 360 kcal/day during the second trimester and another 112 kcal/day in the third trimester
• Effects of exercise
• Consequences of energy restriction
Nutritional Needs During Pregnancy

• Energy:
  – First Trimester - no change
  – Second Trimester - increases 340 kcal/day
  – Third Trimester - increases 452 kcal/day

• Protein:
  – Increases from 46 g/day to 71 g/day
**Vitamin and Mineral Requirements in Pregnancy**

- Pregnant women are at increased risk for folic acid, iron, and calcium deficiencies.

- Recommendations are:
  - Iron – increases to 27 g/day
  - Folate – increases to 0.6 mg/day
  - Calcium - 1000 mg/day
  - Magnesium - increases to 360 mg/day
  - Vitamin C - increases to 85 mg/day
Calcium Requirements

• **DRI Calcium Recommendations**
  - 9 - 18 y/o: 1300 mg/day
  - 19 - 50 y/o: 1000 mg/day (adults, pregnant and lactating)
  - >51 y/o: 1200 mg/day
  - **Increased requirements during the third trimester**
  - **Supplementation shown to reduce hypertension during pregnancy**

• **Dietary sources**
  - Milk, yogurt (8 oz), cheese (1 oz) ~ 300 mg calcium
  - Orange juice- fortified (1 cup = 300 mg)
  - Broccoli, kale (1 cup cooked = 90 mg)
  - Bok choy, mustard green (1 cup cooked =180 mg)
  - Tofu (made with calcium citrate- (½ cup =260 mg)
  - Canned salmon (3 oz = 180 mg)
<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Women 25-50 years</th>
<th>Pregnancy</th>
<th>Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (K cal)</td>
<td>2200</td>
<td>300</td>
<td>500</td>
</tr>
<tr>
<td>Protein (gm)</td>
<td>50</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Vitamin A (µg)</td>
<td>800</td>
<td>800</td>
<td>1300</td>
</tr>
<tr>
<td>Vitamin D (µg)</td>
<td>5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Vitamin C (mg)</td>
<td>60</td>
<td>70</td>
<td>95</td>
</tr>
<tr>
<td>Folic acid (mg)</td>
<td>180</td>
<td>400</td>
<td>280</td>
</tr>
<tr>
<td>Vitamin B12 (µg)</td>
<td>2</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>800</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Phosphorus (mg)</td>
<td>800</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Iodine (mg)</td>
<td>150</td>
<td>175</td>
<td>200</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>15</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>ZINC (MG)</td>
<td>12</td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>
Nutritional Care During Pregnancy

1. Energy intake to meet nutritional needs and allow for about a 0.4-kg (14-oz) weight gain per week during the last 30 weeks of pregnancy
2. Protein intake to meet nutritional needs, about an additional 25 g/day; additional 25 g/day/fetus if more than one fetus
3. Sodium intake that is not excessive but is no less than 2-3 g/day
4. Mineral and vitamin intakes to meet the recommended daily allowances (folic acid and possibly iron supplementation is required)
5. Alcohol omitted
6. Caffeine in moderation: less than 200 mg/day—equivalent of 2 cups of coffee
Diet-Related Complications of Pregnancy

• Nausea and vomiting
  – Usually during first trimester

• Heartburn
  – Common during later pregnancy

• Constipation and hemorrhoids
  – Common during latter stages

• Edema and leg cramps
  – Usually during third trimester
Lactation Overview

- Physiology of lactation
- Nutritional requirements of lactation
Physiology of Milk Production

- **Prolactin**: a hormone secreted from the anterior pituitary gland that acts on mammary glands to initiate and sustain milk production.

- **Oxytocin**: a hormone secreted from the posterior pituitary gland that stimulates the uterus to contract and the mammary glands to eject milk.
Prolactin and Oxytocin activity

• An infant suckling at the breast stimulates the pituitary to release prolactin and oxytocin. Each of these hormones acts on the mammary glands.
  • Prolactin encourages milk production
  • Oxytocin stimulates milk ejection.
  • Each of the hormones also acts on the reproductive organs:
    ▪ Prolactin inhibits ovulation.
    ▪ Oxytocin promotes uterus contractions.
Benefits of Breast-Feeding

**Infant**
- **Decreases incidence and/or severity of infectious diseases**
  Bacterial meningitis, Bacteremia, Diarrhea, Respiratory tract infection, Necrotizing enterocolitis, Otitis media, Urinary tract infection, Late-onset sepsis in preterm infants
- **Decreases rates of:**
  - Sudden infant death syndrome, Types 1 and 2 diabetes, Lymphoma, Leukemia, Hodgkin’s disease
  - Overweight and obesity, Hypercholesterolemia, Food allergies
  - Asthma
- **Neurodevelopment**
- Enhances performance on cognitive development tests, Provides analgesia during painful procedures (heel stick for newborns)
  Promotes mother-child bonding

**Mother**
- **Decreases postpartum bleeding**
- **More rapid uterine involution**
- **Decreases menstrual blood loss**
- **Increased child spacing**
- **Earlier return to prepregnant weight**
- **Decreases risk of breast and ovarian cancer**
- **Possible decreased risk of postmenopausal hip fracture and osteoporosis**
Breast-Feeding Problems and Solutions

Problem

• Retracted nipple(s)
• Baby’s mouth not open wide enough
• Baby sucks poorly
• Baby demonstrates rooting but does not grasp the nipple; eventually cries in frustration
• Baby falls asleep while nursing

Approaches to Management

• Before feeding the infant, roll the nipple gently between the fingers until erect.
• Before feeding, depress the infant’s lower jaw with one finger as the nipple is guided into the mouth.
• Stimulate sucking motions by pressing upward under the baby’s chin. Expression of colostrums often occurs, and the taste may stimulate sucking.
• Interrupt the feeding, comfort the infant; the mother should take time to relax before trying again.
• If the infant falls asleep early in the feeding, the mother should awaken the infant by holding him or her upright, rubbing his or her back, talking to him or her, or providing similar quiet stimuli; another effort at feeding can then be made. If the baby falls asleep again, the feeding should be postponed.
Breastfeeding your babies may help lower your breast cancer risk.

www.cdc.gov/BringYourBrave
#BringYourBrave
Elderly People
Changes with ageing

• Increased risk of **chronic disease**, cognitive impairment and dementia, arthritis

• Activity level *usually* declines

• Decline in **lean body mass** (muscle) and BMR

• Reduction in bone density (especially in women)
  – increased risk of fractures

• Impaired **dentition**

• Impairments in **digestive function** (e.g. gastric acid and digestive enzymes) can lead to reduced nutrient bioavailability

• **Skin changes** (less vitamin D produced)

• Changes in **taste perception** (by age 74-85 the number of taste buds falls by 65% and sensitivity to salty and bitter tastes decrease)

• Changes in **sense of smell** can reduce pleasure of eating

• **Eyesight & arthritis** may make food preparation difficult

• **Psychosocial factors** may also exert a substantial effect on food choice and intake, and hence nutritional status

→ **All may influence nutritional status**
Factors that affect food choice

- Isolation
- Dentition
- Depression
- Disability

Intake, absorption and utilisation of nutrients

- Chronic illness
- Reduced taste perception
- Institutionalisation
- Transport, access, mobility and income
The **Nine “Ds”** of Inadequate Food Intake and Weight Loss In The Elderly:

- Disease
- Depression
- Drugs
- Dementia
- Dysphagia
- Dentition
- Dysgeusia
- Dysfunction
- Diarrhea/Malabsorption

- In about 25% of cases, there is no clear etiology for weight loss.

- When etiology is established the most frequent reasons are:
  - Depression
  - GI (peptic ulcer or motility disorders)
  - Cancer
## Calculating Energy Requirements

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Men kcal/KG</th>
<th>Women kcal/KG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light</strong> (also use if patient is elderly or overweight)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
<td>40</td>
<td>37</td>
</tr>
<tr>
<td><strong>Heavy</strong> (also use if patient is underweight)</td>
<td>50</td>
<td>44</td>
</tr>
</tbody>
</table>
“If exercise were a pill it would be the most prescribed medication in the world”