

# **Chapter 12: Child and Preadolescent Nutrition**

# Definitions of the Life Cycle Stage

- ***Middle childhood*** children between the ages of 5 and 10 years.
  - also referred to as “school-age”
- ***Preadolescence*** ages 9 to 11 years for girls and ages 10 to 12 years for boys.
  - “School-age” is also used to describe preadolescence.

# Importance of Nutrition

- iron-deficiency anemia
- Under-nutrition
- dental caries
- Obesity
- Eating disorders

# Importance of Nutrition

1. Adequate nutrition

2. The establishment of healthy eating behaviors

# Growth and Development

- The growth rate is steady !
- The average annual growth during the school years is :
  - 7 pounds (3–3.5 kg) in weight
  - 2.5 inches (6 cm) in height



# Tracking growth

- The tracking of **BMI for- age percentile** is an important screening tool for **overweight** and **obesity** as well as **under-nutrition**.
- Make sure to:
  - use the correct age of the child when plotting on the growth charts
  - use the most current growth curves will help to avoid errors.

# Tracking Growth

- Gender-specific BMI-for-age
  - greater than or equal to the **85th** percentile but less than or equal to the **94th** percentile defines → **overweight**
  - greater than or equal to the **95th** percentile define → **obesity**



# Physiological Development

- During the early childhood years, **Percent body fat** then increases in preparation for the adolescent growth spurt.
- ***“Adiposity rebound”*** or ***BMI rebound***
- In females greater than males !

# *Adiposity rebound*

- Concerns about becoming **overweight !!!**
- The increase in body fat during this stage is part of normal growth and development.
- Girls body image concerns
  - Reassure- it is not permanent
- Boys muscle mass concern
  - Inform- muscle mass cannot happen until middle adolescence

# Development of Feeding Skills

- masters the use of **eating utensils**
- can be involved in simple food preparation
- can be assigned chores related to mealtime such as setting the table

# Eating Behaviors

- The eating behaviors and cultural food practices and preferences of **parents and older siblings** will influence the child's food likes and dislikes.
- Parents are responsible for the food environment in the home
  - What foods are available???
  - When they are served ???

# Family Mealtime

- Studies showed that:
- Children who ate dinner with their families had:
  - higher energy intakes (higher appetite)
  - higher intakes of nutrients such as fiber, calcium, folate, iron, and vitamins B6, B12, C, and E.
  - Reported eating more fruits and vegetables
  - less fried food when away from home
  - drinking fewer soft drinks.

# Outside Influences

- Peers influence
- Teachers and coaches
  - What is learned in the classroom should be reinforced by foods available in the **school cafeteria**

# Media Influence

- Children want to try foods they see advertised on television.
- Most of the ads. are for foods or beverages high in fat, sodium, or added sugars or were low in nutrients

# Snacking

- During middle childhood, children cannot consume large amounts of food at one time
- Therefore need snacks to meet their nutrient needs



# Body Image/Excessive Dieting

Parents who had difficulty controlling their own intakes seemed to impose more restrictions on their children

# Energy and Nutrient Needs of School-Age Children

From Dietary Reference Intakes  
(**DRIs**).

# Energy Needs

- Dependent on the child's activity level and body size.
- Energy allowances based on body weight are lower for school-age children than for toddlers and preschoolers.
  - As a reflection of **slowing growth rate**

## Children and Adolescents 3-18 years

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*Estimated Energy Requirement (kcal/day) = Total Energy Expenditure + Energy Deposition*

### Boys

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#### 3-8 years

$$\text{EER} = 88.5 - (61.9 \times \text{age [y]}) + \text{PA} \times \{ (26.7 \times \text{weight [kg]}) + (903 \times \text{height [m]}) \} + 20$$

#### 9-18 years

$$\text{EER} = 88.5 - (61.9 \times \text{age [y]}) + \text{PA} \times \{ (26.7 \times \text{weight [kg]}) + (903 \times \text{height [m]}) \} + 25$$

### Girls

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#### 3-8 years

$$\text{EER} = 135.3 - (30.8 \times \text{age [y]}) + \text{PA} \times \{ (10.0 \times \text{weight [kg]}) + (934 \times \text{height [m]}) \} + 20$$

#### 9-18 years

$$\text{EER} = 135.3 - (30.8 \times \text{age [y]}) + \text{PA} \times \{ (10.0 \times \text{weight [kg]}) + (934 \times \text{height [m]}) \} + 25$$

## Physical Activity Coefficients (PA values) for use in EER equations

	<b>Sedentary (PAL 1.0-1.39)</b>  <b>Typical daily living activities (e.g., household tasks, walking to the bus)</b>	<b>Low Active (PAL 1.4-1.59)</b>  <b>Typical daily living activities PLUS 30 - 60 minutes of daily moderate activity (ex. walking at 5-7 km/h)</b>	<b>Active (PAL 1.6-1.89)</b>  <b>Typical daily living activities PLUS At least 60 minutes of daily moderate activity</b>	<b>Very Active (PAL 1.9-2.5)</b>  <b>Typical daily living activities PLUS At least 60 minutes of daily moderate activity PLUS An additional 60 minutes of vigorous activity or 120 minutes of moderate activity</b>
Boys 3 - 18 y	1.00	1.13	1.26	1.42
Girls 3 - 18 y	1.00	1.16	1.31	1.56
Men 19 y +	1.00	1.11	1.25	1.48
Women 19 y +	1.00	1.12	1.27	1.45

# Protein

- The recommended protein intake for school-age children is **0.95 gram of protein per kg body weight per day** for 4- to 13-year-old girls and boys
- **Vegetarian diet** (complementary protein foods!!) : if they meet their energy intake to **spare protein for growth and tissue repair.**

# Vitamins and Minerals

- According to food-consumption surveys, children's mean intakes of most nutrients meet or exceed the recommendations.
- Except for some key nutrients among some subsets of children
  - Iron and zinc (for growth)
  - Calcium (peak bone mass)

# Common Nutrition Problems

- During the last century, common nutrition problems have shifted from **problems of nutrient deficiencies** to **problems of excess nutrition**
  - Energy
  - Fat
  - Salt



# Iron Deficiency

- Not as common a problem in middle childhood as it is in the toddler age group
- The diagnosis of anemia:
- For children 5 -8 years,
  - if hemoglobin concentration is <11.5 g/dl and hematocrit <34.5%.
- For children 8 - 12 years ,
  - a hemoglobin value <11.9 g/dl or hematocrit <35.4%

# Dental Caries

- The amount of time that children's teeth are exposed to carbohydrates influences the risk of dental caries
- Complex CHO vs. simple CHO
- Sticky CHO !!!
- Fluoride source (water or supplements)

# **Prevention of Nutrition- Related Disorders in School-Age Children**

# Overweight and obesity

- Despite the increase in the prevalence of overweight, analysis of dietary data from NHANES I, II, and III **indicates no corresponding increase in energy intake** among children over the years!!
- → This finding suggests that **physical inactivity** may be a significant contributing factor

# Overweight and obesity

- According to the NHANES 2011-2012 data, approximately **17.7% of children** ages 6 through 11 years are obese, with BMIs-for-age greater than or equal to the 95th percentile
- In Palestine, ????
- In the Arab world, ????

# Characteristics of Overweight Children

- Taller
- have advanced bone ages
- experience sexual maturity at an earlier age than their non-overweight peers.
- May look older than they are

# Obesity and overweight risk factors

- increase in **chronic disease** risk factors with increasing BMI-for-age.
- **Type 2 diabetes** is increasing among children and preadolescents
  - up to 85% of affected children being either overweight or obese at diagnosis

# Predictors of Childhood Obesity

## 1. Early BMI rebound

- is defined as beginning before 5.5 years of age
- The average age of BMI rebound is 6.0–6.3 years
- Possible explanation ??
- **Studies suggest that the age at which BMI rebound occurs may have a significant effect on the amount of body fat that the child will have during adolescence and into adulthood !!!**
- **P315**



# Predictors of Childhood Obesity

## 2. Child's home environment

1. **Maternal obesity** was found to be the most significant predictor of childhood obesity

1. Genetic factors
2. Environmental factors

2. followed by **low family income**

3. Screen time

1. **More food**
2. **Less PA**
3. **Ads**

# Assessment of Overweight and Obesity

- **Body mass index-for-age percentile**
  - Overweight :
  - Obese :
- Other components of assessment include evaluation of the child's medical risk, including :
  - parental obesity
  - behavior risk, including dietary and physical activity behaviors.
- It is also essential to evaluate the child's and/ or family's attitude toward and willingness to make behavior changes

# Treatment of Children Obesity

- The overall goal of treatment → to develop healthy eating and physical activity behaviors for a lifetime

# Treatment of Overweight and Obesity

- The four stages include:
  - Stage 1: Prevention Plus
  - Stage 2: Structured Weight Management (SWM)
  - Stage 3: Comprehensive Multidisciplinary Intervention(CMI)
  - Stage 4: Tertiary Care Intervention (reserved for severely obese adolescents)

# Treatment of Children Obesity

Category	Goal of treatment
Overweight (85 <sup>th</sup> - 94 <sup>th</sup> )	<b>weight maintenance</b> or a <b>slowing of the rate of weight gain</b> until a BMI for-age percentile <85 <sup>th</sup> is achieved
95 <sup>th</sup> to 98 <sup>th</sup>	<b>weight maintenance</b> or <b>gradual weight loss of no more than 1 pound</b> per week is the goal until the BMI-for-age percentile drops to <85 <sup>th</sup>
≥99 <sup>th</sup>	<b>Weight loss not to exceed to 2 pounds</b> per week until a BMI-for-age percentile of <85 <sup>th</sup> is achieved.

# Multicomponent intervention

- Parent training
- Dietary counseling/nutrition education
- Physical activity
- Addressing sedentary behaviors
- Behavioral counseling

# Dietary supplements

- Recommended for children who are at high risk of developing nutrient deficiencies or have one or more

# Children at risk for nutrient def.

- 1. With anorexia or an inadequate appetite or who follow fad diets
- 2. With chronic disease
- 3. From deprived families or who suffer from parental neglect or abuse
- 4. Who participate in a dietary program for managing obesity
- 5. Who consume a vegetarian diet without adequate intake of dairy products
- 6. With failure to thrive



# **Dietary Recommendations**

# Iron

- Although iron deficiency anemia is not very common in this stage
- It is important to have their adequate intake of iron
  - Inclusion of high iron sources
    - Meats, beans, fortified cereals
  - Good source of vitamin C

# Fiber

- The new recommendations for ***total fiber*** intake based on the DRIs can be found in Table 12.5
- **Between 25-30 gram**

# Fiber

- increasing the amount of fresh fruits and vegetables and whole-grain breads and cereals being offered
- Beans and legumes
- Cereals ( **mixed with other cereals to be palatable**)
- Using these sources **in Recipes** ( muffins, pancakes, ...)

# Fat

- low-fat dairy products, and lean meats, fish, and poultry
- However, an appropriate amount of dietary fat is necessary to meet children's needs for calories, essential fatty acids, and fat-soluble vitamins.

# Calcium and Vitamin D

- 800 milligrams for children aged 4 to 8 years
- 1300 milligrams for children 9 through 18 years
- The higher recommendation for older children reflects the fact that **most bone formation occurs during puberty**
- Good sources of calcium ??
- **It is difficult to get the recommended amount of Calcium without including dairy products**

# Vitamin D

- Necessary for calcium absorption
- The American Academy of Pediatrics recently **doubled** the recommended amount of vitamin D for all healthy infants, children, and adolescents from 200 IU per day to 400 IU per day

# Vitamin D

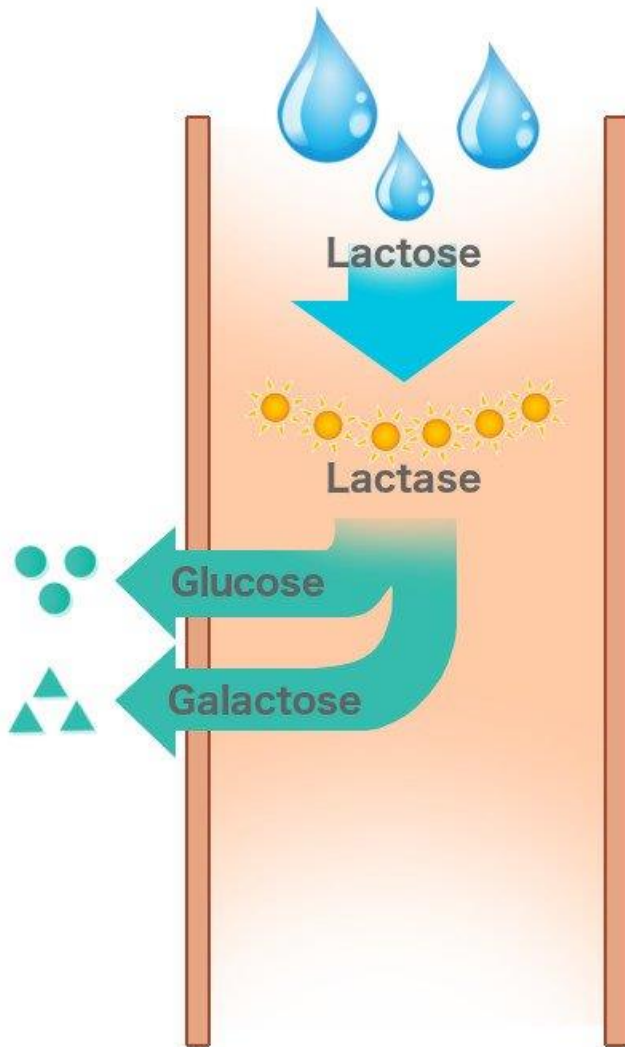
- Main sources of vitamin D include :
  - exposure to sunlight
  - vitamin D–fortified foods such as fortified cereals
  - vitamin D–fortified milk (100 IU per 8 ounces)
- Children who are at risk for vitamin D deficiency include
  - those with increased skin pigmentation, including African-Americans and Hispanics,
  - those with limited sunlight exposure



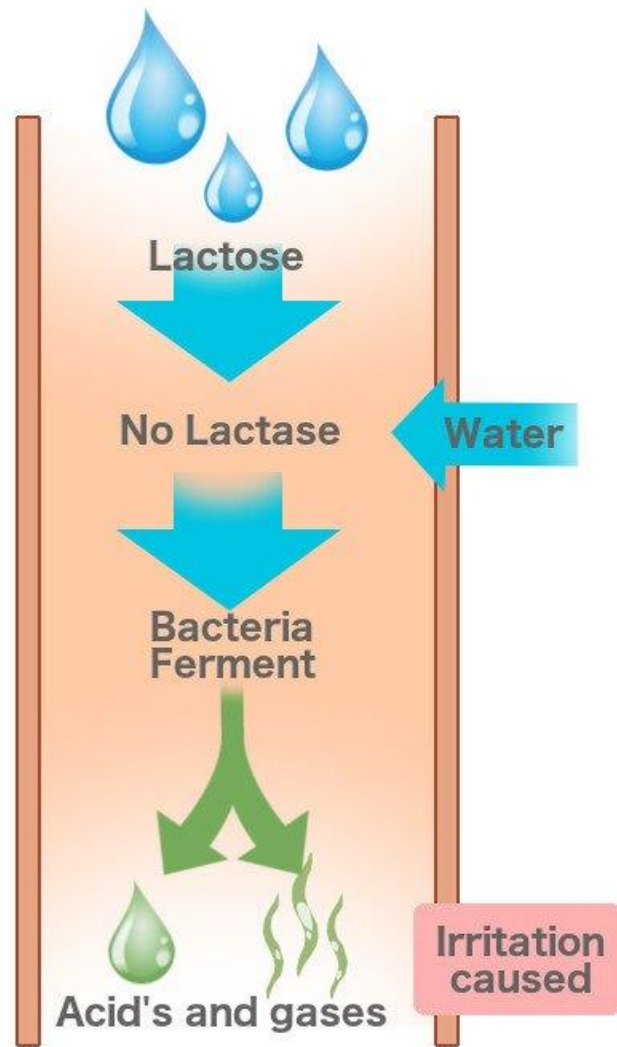
# Lactose Intolerance

- Lactose intolerance is a clinical syndrome of one or more gastrointestinal symptoms, such as abdominal pain, diarrhea, nausea, flatulence or bloating, after consumption of lactose or lactose containing foods or beverages

primary vs. secondary lactase deficiency



**Normal Lactose Digestion**



**Lactose Intolerant**

# Primary Lactose Intolerance

- Affected individuals have varying degrees of lactose intolerance, and dairy products should be included in their diets as individually tolerated
- Having lactose-containing foods in **small amounts, spaced throughout the day, and eaten with other foods** may be tolerated by many people with lactose intolerance

# Secondary lactose intolerance

- can be caused by injury to the small bowel, such as from an acute infection.
- The underlying condition should be treated
- the **elimination of lactose from the diet is not necessary at all**
- milk products should definitely be resumed once the underlying condition has resolved.

# Lactose intolerance

- The concern with both primary and secondary lactase deficiency is **to avoid the total elimination of dairy products from the diet** when it may not be necessary, as these foods are important sources of calcium, vitamin D, and other nutrients

# Fluids

- children are at risk for dehydration and heat-related stress
- Children sweat less, and they get hotter during exercise

- Responsibility of parent/ caregiver / supervisor of PA to monitor fluid intake
  - Drink before, during and after exercise
- Thirst mechanism may not work as well during exercise/ children may not realize that they are thirsty
- Water- best source for replenishment
- Flavored drinks- sports drinks 4-8% carbs and diluted fruit juice are appropriate for children
- Soft drinks and undiluted juice should be avoided
  - Less hydrating, could cause stomach cramps, nausea, and diarrhea

- Soft drinks and sugar-sweetened beverages-  
increased in consumption with age
- *On avg, sugar-sweetened beverages add 230kcal/d to  
the school-age child's overall E intake, with most of the  
calories being consumed at home*



# PA recommendation

- At least 60mins of PA/d
- Recommendations for parents to improve child PA level?
- Supportive environment?
- Organized sports

# Determinants of PA

- Can include physiological, environmental, psychological, social, and demographic factors
  
- Research findings:
  - Girls are less active than boys
  - Physical activity decreases with age
  - Physical education in schools has decreased