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Infant and Child Nutrition:
Learning Objectives

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1. Explain the use of anthropometry and growth charts in the assessment of a child's nutritional status.
2. Identify the feeding stages throughout infancy and childhood along with nutrition issues among school-age children and adolescents.
3. Distinguish the differences between etiology and clinical presentation of marasmus versus kwashiorkor.
4. Explain the increase in obesity among children, the factors that contribute to it, and appropriate intervention strategies:
5. Identify factors that impact the quality of diet in the family.
6. Describe ways a physician can help families improve the nutritional quality of their diets.

Infant and Child Nutrition: Answers to Learning Objectives

1. Explain the use of anthropometry and growth charts in the assessment of a child's nutritional status

During routine health physicals throughout a child's life, physical growth is assessed by three primary anthropometric measures; weight, length/height, and head circumference. These measurements are then plotted on standard CDC Growth Charts.

Weight

- Weight is the first measure to be affected by inadequate nutrition.
- Weight is evaluated as weight for age, weight for length/height, and BMI.
- Low weight for age with normal height is termed acute malnutrition.
- Overweight is assessed by high BMI or high weight for height.

Length/Height

- Length or height is evaluated as length or height for age.
- Length or height is affected by prolonged malnutrition and is referred to as chronic malnutrition.
- Weight for length/height can be normal despite low length/height for age, meaning that the child has adequate weight for his or her length/height. However, this could be a sign of stunting or nutritional dwarfism and is generally secondary to prolonged chronic nutritional deficiency (seen in developing countries or chronically ill children).

Head Circumference

- Evaluated up to three years of age
- Falls off after height does and may be associated with developmental delay

Use of Growth Charts

- When plotted correctly, a series of accurate weights and measurements of stature or length offer information about a child's growth pattern. Factors that may influence this pattern are gestational age, birth weight, parental stature, and nutritional status.
- A drop to a lower percentile in weight is usually an indication of some disruption in the child's expected growth.
- A drop to a lower percentile in length/height is a serious indication of stunting of growth that involves eating patterns or disease.
- A change in weight/length (or weight for height) is a more sensitive indicator of a change in the child's weight growth pattern.
- Changes in head circumference are serious because changes in development and mental ability are not reversible.

Anthropometric Index	Percentile Cut-off Value	Nutritional Status Indicator
BMI-for-Age	$\geq 95^{\text{th}}$	Overweight
Weight-for-Length	$> 95^{\text{th}}$	Overweight
BMI-for-Age	$\geq 85^{\text{th}}$ and $< 95^{\text{th}}$	At Risk of Overweight
Weight-for-Length	$< 5^{\text{th}}$	Underweight
Length/Height-for-Age	$< 5^{\text{th}}$	Short Stature
Head Circumference-for-Age	$< 5^{\text{th}}$ and $> 95^{\text{th}}$	Developmental Problems

2. Identify the feeding stages throughout infancy and childhood along with nutrition issues among school age children and adolescents.

- Infants:** Infants are born with a natural sucking instinct. Infants are not physiologically ready to accept solid foods from a spoon until approximately 4 months of life. Introducing solid food prior to 4 months may stimulate the development of food allergies. The progressive introduction of solid foods of varying textures teaches infants how to chew and swallow without choking, aids in mouth and jaw development, and encourages the acceptance of new tastes and textures. New foods should be introduced gradually – generally not more than one every 3 days. The most common initial solid food is rice cereal, then fruits and vegetables, meats, and starches. Egg yolks can be introduced to infants over the age of 6 months, but egg whites not before 1 year of age because of the potential for an allergic reaction. It is important to realize that solid foods supplement an infant’s diet, but the majority of calories and nutrients are provided by breast milk (or formula) throughout the first year of life. Foods introduced should be of high nutritional value.
- Toddlers:** Toddlers are learning to be independent and to feed themselves with a cup, spoon, and fork. As their growth rate varies, so do their appetites, which may fluctuate from day to day. Studies have shown that when children are allowed to determine on their own how much they eat, their intake may vary considerably from meal to meal, but over a period of days and weeks, it remains reasonable stable. Exposing children to a wide variety of nutritious foods at an early age, and allowing them to decide how much of it to eat, will help to develop food acceptance and avoid conflict. This assumes all foods introduced are of high nutritional quality, and desserts and sweets are very occasional. To avoid potential conflicts around food, parents should aim to provide their children with a wide variety of nutritious food and children should be allowed to determine how much food they need to eat.
- Preschool Children:** Same main issue as above – to avoid potential conflicts around food, parents should aim to provide their children with a wide variety of nutritious food and children should be allowed to determine how much food they need to eat. Keeping “junk food” to a minimum in the household will help avoid conflicts about food and help to prevent weight gain from consuming excessive calories.
- School Age Children:** School age children will be exposed to foods not available in their own households and will want greater independence in deciding what they want to eat. Television also has a big impact on what children want their parents to buy. A good rule to adopt is that parents decide what foods to purchase and serve (healthful choices) and the child decides what to select from this offering and how much to eat. Obesity among

children is on the rise, so limits should be placed on the amount of sweets, sodas, and snack foods available in the home.

- **Adolescents:** Adolescents undergo major physical and psychological changes that affect their behavior and nutritional status. Their increased growth and development requires a nutrient-dense diet, at the same time that issues over body image, weight control, and their own independence take precedent. Specifically, during the adolescent “growth spurt,” the need for energy and most nutrients increases. Adolescents incorporate twice the amount of calcium, iron, zinc, and magnesium into their bodies than at any other time. Unfortunately, junk foods and soda often replace calcium-rich milk products as well as nutrient-rich fruits and vegetables in the typical adolescent’s diet. Issues over dieting can lead to unhealthy food restrictions, while too much high fat, high sugar, fast food, and snacks contribute to obesity, Type II diabetes, and elevated cholesterol levels – now on the rise among children and adolescents. Healthful food choices at school, along with nutrition education, is important to prevent obesity and chronic disease among children and adolescents.

3. Distinguish the differences between the etiology and clinical presentation of marasmus versus kwashiorkor.

- **Marasmus** - deficiency of energy-providing foods, semi-starvation. The child adjusts by reduced growth, displays muscular wasting and the absence of subcutaneous fat. The child is said to have the “old man” face. Occurs in children of all ages and is associated with failure to breastfeed, diluted formulas, and food shortages.
- **Kwashiorkor** - protein malnutrition associated with high carbohydrate diets where protein is inadequate. The child may appear normal weight due to fluid retention. Protein deficiency leads to hypoalbuminemia, pitting edema and enlarged fatty liver. Subcutaneous fat is preserved but there is preferential loss of lean body mass that may be masked by edema. Check dietary intake, serum albumin, and serum pre-albumin. This happens most often at weaning from the breast when low protein foods in the form of gruels or porridge are introduced as the weaning foods.

4. Explain the increase in obesity among children, the factors that contribute to it, and appropriate intervention strategies:

Obesity in Childhood and Adolescence

According to the National Health and Nutrition Examination Survey (NHANES) III (1988-1991), the prevalence of childhood obesity is rising among the population of the United States. The NHANES III data indicated that 20 percent of boys and 22 percent of girls age 12-19 are overweight, based on the body mass calculation. The prevalence of obesity has increased 50-100 percent among children over the last 20-30 years. A rate of 15 percent is the nation’s target goal according to the *Healthy People 2000* report.

Factors:

- Increased high fat, high sugar foods, increased snacking
- Decreased activity (sedentary activities like television)

Appropriate Intervention Strategies:

- Increase in physical activity. Minimize sedentary behavior, including television watching, video games, and computer time.
- Dietary modification, focusing on lower fat choices of food, decrease in “junk” or snack foods, and portion control. Focus on low glycemic index foods, like vegetables, fruits, whole grain breads and cereals, and lean milk and protein to provide nutrients and curb appetite.
- Active participation of family
- Comprehensive treatment programs are moderately effective in treatment of childhood obesity

5. Identify factors that impact the quality of diet in the family.

- Parents have inadequate money for fruits, vegetables, and dairy products
- Parents have inadequate knowledge about nutrition
- Parents do not know how to cook or have few meal preparation skills
- Parents are stressed and do not take the time or energy to prepare meals
- Family seldom eats together
- Meals are not a positive time for the family

6. Describe ways a physician can help families improve the nutritional quality of their diets.

- Educate parents on importance of nutrition for the health and well-being of their children and themselves.
- Encourage parents to make the decisions about foods to purchase and serve
- Educate parents on the importance of exercise and “decreasing inactivity.”
- Refer parents and children to a Registered Dietitian for a detailed nutrition assessment and meal plan.
- Be aware of and use the WIC supplemental food program (Women, Infants and Children Nutrition Program) for eligible pregnant women, infants, and children under the age of five.
- Encourage children and adolescents to make healthful food choices. Encourage them to moderate their intake of treats, snacks, fast food, etc. Provide them with “kid-friendly” handouts on tasty, nutritious snacks and meals.
- Encourage children and adolescents to exercise.

Reference:

Information in this chapter is excerpted from Chapter 4, “Infants, Children and Adolescents” AM Tershakovec from Medical Nutrition and Disease, Second Edition, Blackwell Science LTD, 1999.

Useful Websites:

The Healthy School Meals Resources System (HSMRS):

<http://schoolmeals.nal.usda.gov>

Helping Your Overweight Child:

http://win.niddk.nih.gov/publications/over_child.htm